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The cup-like parts on the die illustrate this operation. *At left*, the piece before stamping. *At right*, the finished piece after stamping with Stanostamp.

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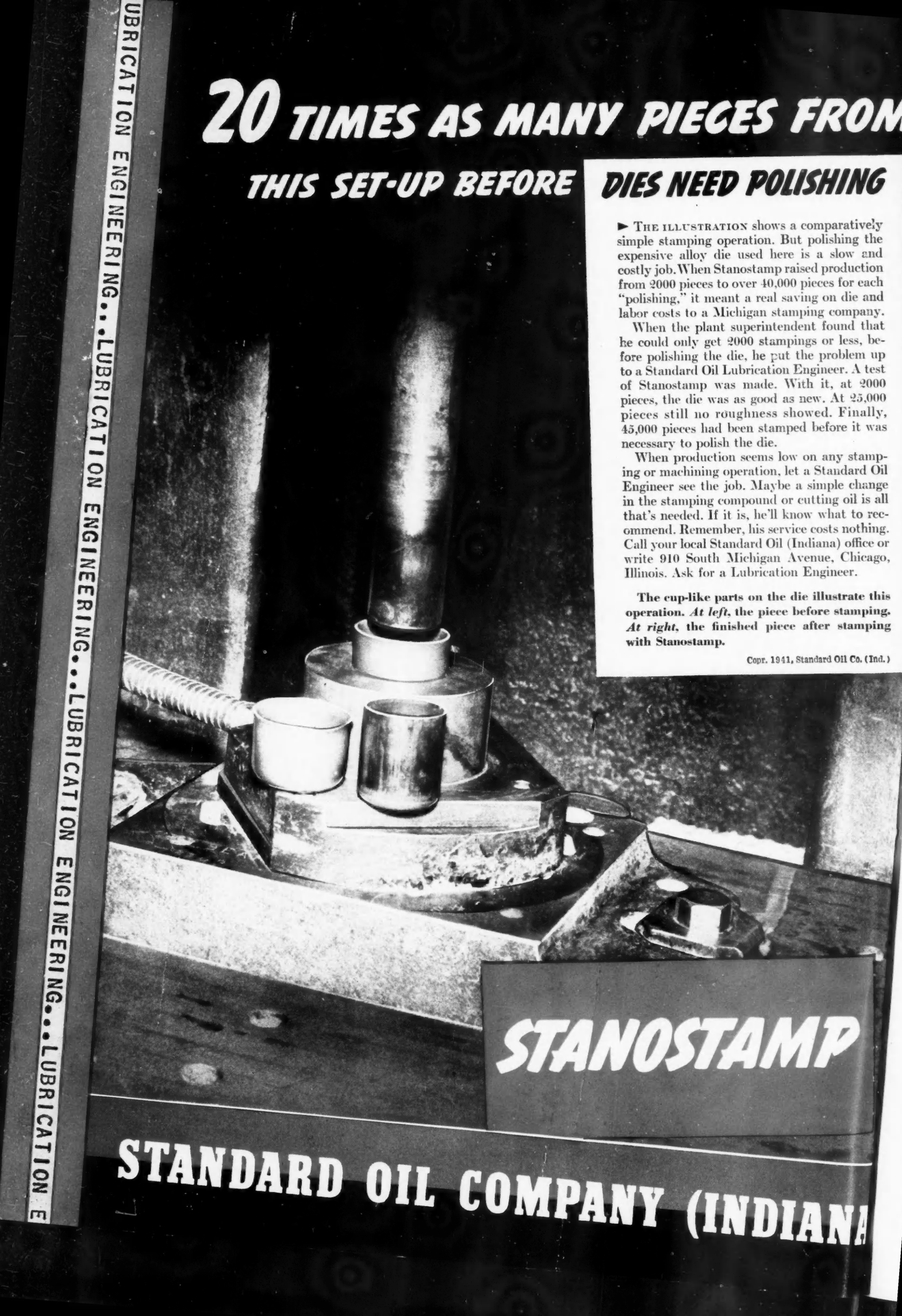

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STANOSTAMP

STANDARD OIL COMPANY (INDIANA

AUTOMOTIVE INDUSTRIES
The AUTOMOBILE

Reg. U. S. Pat. Off.
Published Semi-Monthly

Volume 84 Number 9

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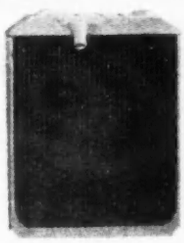

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IN THIS ISSUE . . .

AUTOMOTIVE INDUSTRIES

Reg. U. S. Pat. Off.

Volume 84 May 1, 1941 Number 9

GENERAL

"Tooling Up" for the Ford Election **461**

The largest election to settle labor difficulties of any single industrial plant is to take place shortly at the Ford River Rouge plant. Owing to many contributing factors the problems presented are different from those presented at any of the previous NLRB elections. Here are the plans and arrangements in detail. With all of the ramifications it makes instructive and interesting reading.

PRODUCTION

At the Johnson Plant **464**

The manufacture of outboard motors in a mass production set-up have many details in common with the manufacturing routine of other organizations in the production of automotive parts. From "stem to stern" the reader is conducted through the plant with comprehensive thoroughness.

BUS BODIES

Chassis and Body Construction of a Modern Bus **474**

The makeup of bus bodies presents many interesting features of production and design. The collaborating authors of this article are well qualified to give all of the answers.

GAS PRODUCERS

Producer Gas is the Motor Fuel of Finland **482**

Here is a development of more than usual interest. With the shortage of gasoline in European parts this phase of automobile development is most timely. How these producers are designed, made and operated is fully explained in this article.

Changes in Petroleum Product Tests Planned

At committee meetings of the American Society for Testing Materials in Washington recently, Committee D-2 on Petroleum Products and Lubricants took several important actions, some of them involving proposed standards. It was voted by the sub-committee on viscosity to recommend a revision of the present test for sulfur in petroleum oils by the lamp method (D 90-34 T), the changes providing for the use of a purified air supply and of a fritted glass plate in the absorber. Analytical procedures for the determination of sulfur, chlorine and phosphorus in EP lubricants have been circulated among the members of a sub-committee.

Another sub-committee recommends that a new procedure for saponification number, which utilizes methyl ethyl ketone, be adopted in place of the present tentative method, D 188-27 T. It also recommends that the new so-called "General Motors Rapid Method" and a potentiometric method for neutralization number be published as information.

Approval of the proposed test for aniline point of petroleum products as a tentative standard of the A.S.T.M. was recommended, as was adoption of a standard of the test for sulfur in petroleum oils by the lamp method (D 90-34 T).

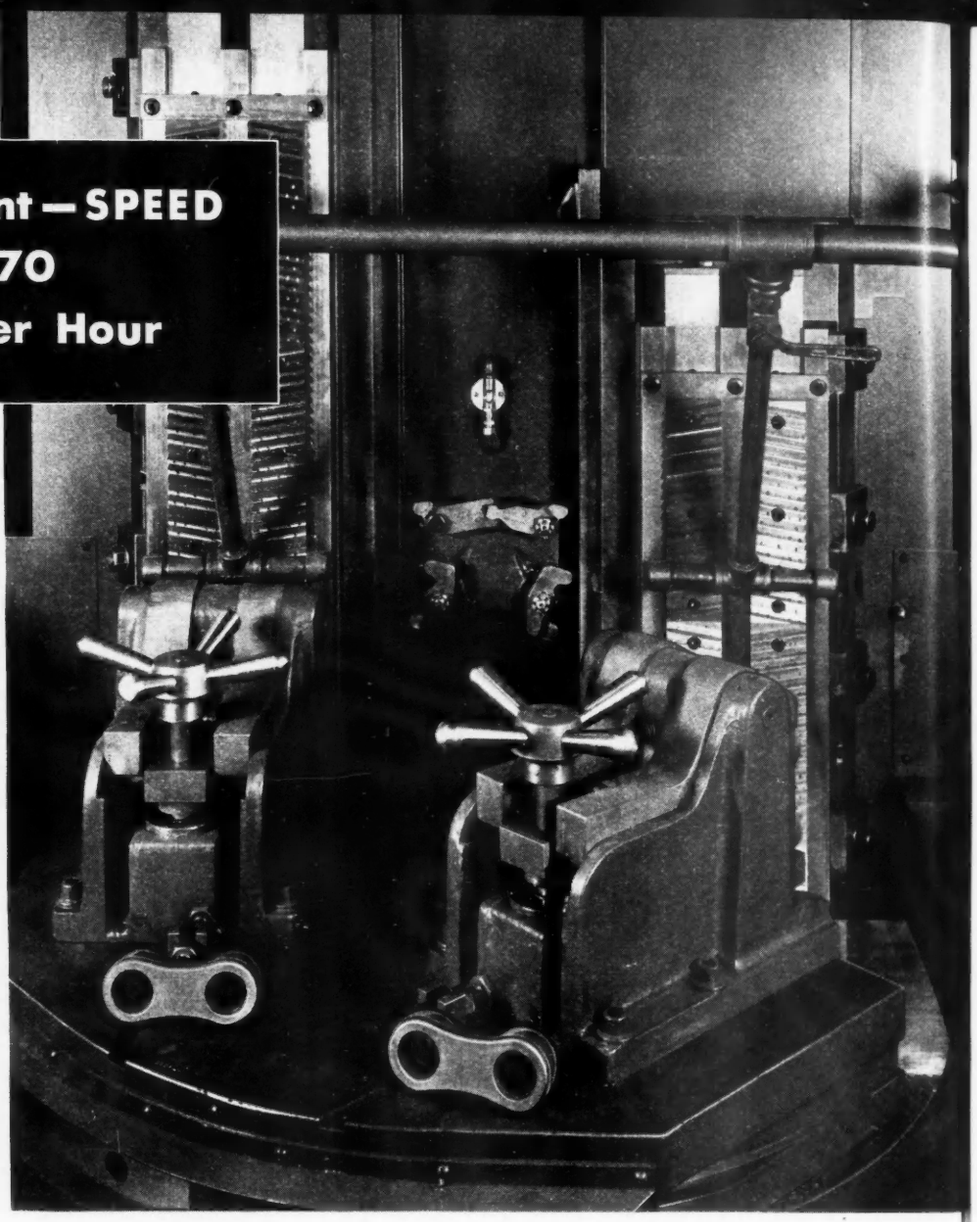
The sub-committee on gum released the procedure for the determination of potential gum in aviation gasoline and recommended its publication "for information only."

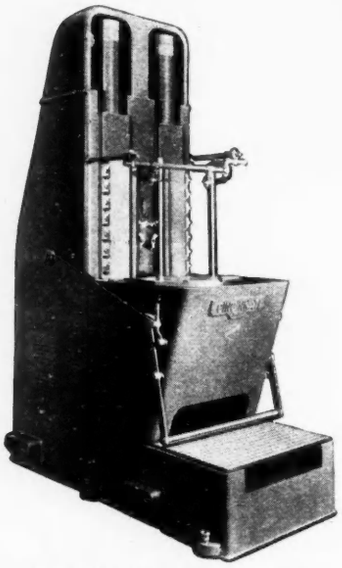
A number of minor changes were recommended in the test for tetra ethyl lead in gasoline (D 526-39 T). Cooperative work with other A.S.T.M. committees interested in a standard procedure for the determination of lead in gasoline is planned.

Proposed specifications for aviation gasoline will be submitted for approval as an A.S.T.M. tentative standard. These will cover three grades, with minimum octane numbers of 73, 91, and 100.

Changes relating to distillation temperatures, pour, cetane number, flash and carbon-residue are recommended for the Diesel Fuel Oil Classification, which is to be for "information only."

One Requirement—SPEED —Nets 570 End Plates Per Hour





CINCINNATI No. 10-54 Duplex Hydro-Broaching Machine

THE parts shown above—end plates for tractors—must be produced *rapidly*. Accuracy and finish are secondary. Of course, the machine is capable of producing smooth finishes and close accuracy, but these virtues are only temporarily extraneous. Being a standard product—a CINCINNATI No. 10-54 Duplex Vertical Hydro-Broach—it can be used later where these two qualities are important. For the part illustrated, *speed* of production is the chief requirement, and *speed* to the amount of 570 parts per hour can be obtained.

There are several features of the CINCINNATI Hydro-Broach contributing to their rapid production characteristics. Practically continuous cutting with the exclusive swivel table arrangement—one ram, say the left hand, cuts on the down stroke while the right hand ram returns to the top and the operator loads and unloads the right hand fixture. Dovetail and clamp arrangement for the broach holders speeds set-up time. Other features are illustrated and described in catalog M-894. Write for your copy today.

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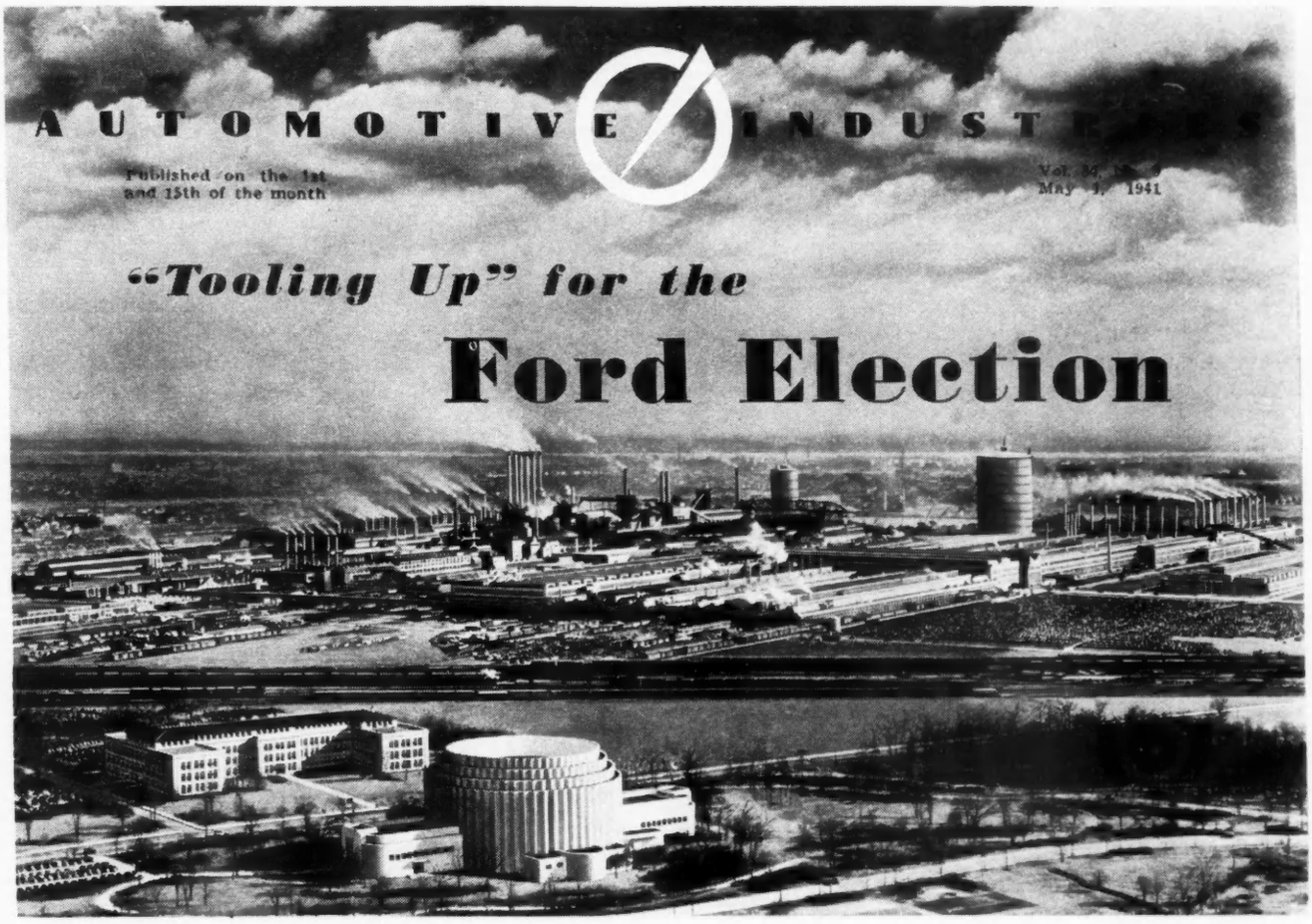


By E. L. WARNER, JR.

SOME TIME this month approximately 80,000 workers in the huge Ford Motor Co. Rouge plant will go to the polls to determine by ballot what union, if any, will represent them as a collective bargaining agency. Thus will take place the largest election in a single industrial plant in the history of the National Labor Relations Board, because the Rouge plant is the largest such unit in the world. The election also may mark the fall of the Ford Motor Co. as the last stronghold of the non-union shop in the automobile industry. History of elections in the industry has shown that the workers seldom vote for "no union" in preference to union representation.

Criticism has been directed at the NLRB for allowing a period of 45 days between the time the election was ordered at a hearing in Washington April 7 and the actual election. It has been maintained that allowing such a length of time to elapse between the order and the election permits the unions to engage in intensive electioneering activities while the company merely marks time. However, in the case of the Ford election, there is an immense amount of detail that must be gone through before the voting lists are ready, and this may easily consume a month's time.

The worker at the Ford River Rouge plant, and also at the Lincoln Motor Car Division in Detroit, which employs 3700 men, will have three choices of squares in which to mark his ballot. He can vote for the UAW-CIO, which holds the majority of collective bargaining contracts in the automotive industry. He can vote for the Federal Labor Union (AFL), which had charters granted at the Rouge and Lincoln plants in February. Or he can vote for "no union."

The Ford Brotherhood of America, an independent union formed in 1937 to combat the UAW-CIO, was denied a place on the Ford ballot by the NLRB. The board held that the 20,400 membership cards submitted by the Brotherhood all were dated June 3, 1937, and authorized the organization to represent the signers "for a period of one year from the date thereon." Because no new cards had been signed since December, 1937, no membership meetings held nor any dues collected, the NLRB ruled out the Brotherhood's plea.

Production, maintenance and clerical workers eligible for the Rouge and Lincoln elections, according to the board's order, are "All those employed by the company at any time during the month of March; those who were ill, on vacations, or in the military service of the U. S.; and all those who have been laid off within 90 days.

Those not eligible to vote under the board's order are:

(1) Direct representatives of the management, such as officers and directors of the company; sales managers and assistant sales managers; factory managers and assistant factory managers; directors and employes of sales, accounting, personnel and industrial

GENERAL

relations departments; directors of purchases and assistant directors of purchases; superintendents and assistant superintendents.

(2) General foremen, foremen and assistant foremen; all other persons working in a supervisory capacity (but not leaders, pushers or inspectors), including follow-up men and those having the right to hire or discharge, and those whose duties include recommendation as to hiring or discharging.

(3) Sociological workers and personnel investigators; service men; plant protection employes; time study men; all clerical and secretarial employes (including telephone operators) in the Rotunda and Administration buildings and in the offices of the building superintendents and department superintendents and in the branch stock offices and in the main and badge cribs.

(4) Designing (drawing board), production, estimating and planning engineers; draftsmen and detailers; physicists; chemists; metallurgists; artists; designer artists; clay and plaster modelers (but not those who make patterns).

(5) Timekeepers, training school students (but not apprentices); instructors and clerks in all schools; fire department chiefs, captains, inspectors, clerks, leaders and their assistants.

(6) Kitchen, cafeteria and dining room help (but no auxiliary help from production or maintenance departments).

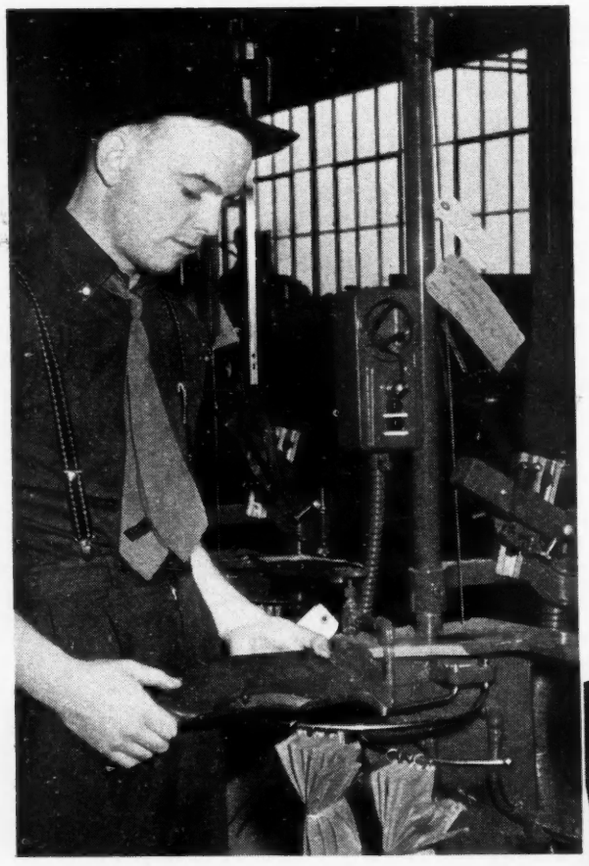
(7) Hospital and first aid employes, and field men for medical department (but not maintenance employes in hospital department).

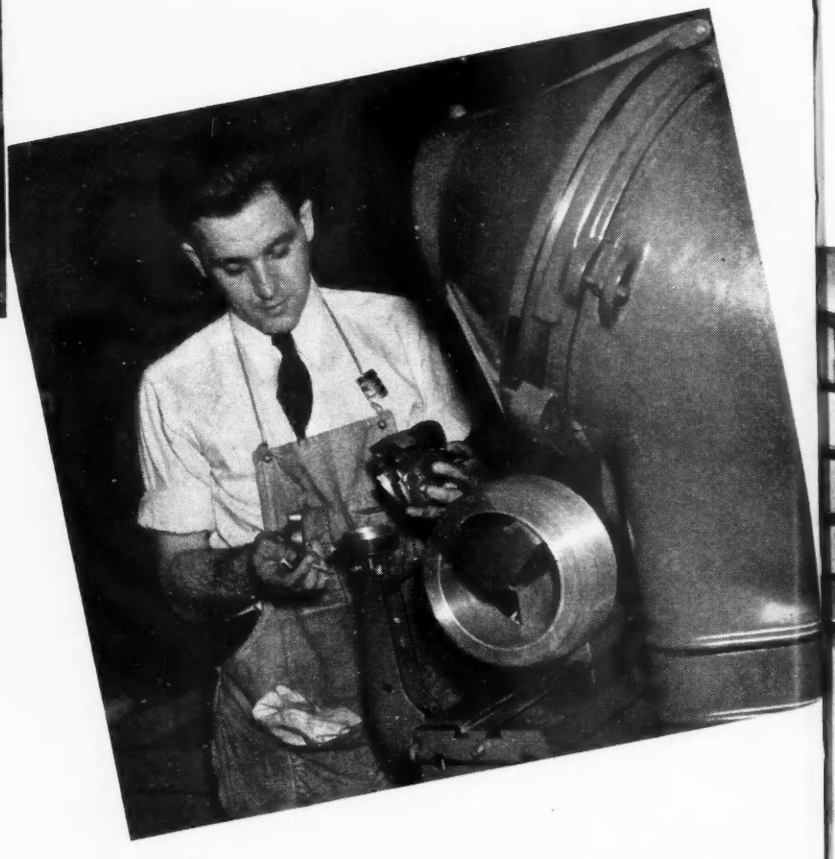
(8) Safety inspectors, stock checkers; all employes in engineering and airport buildings; and all employes of the photographic department, including those who work on blueprints.

It is estimated that these exemptions which were agreed upon by both the company and the union, will embrace more than 7000 workers at the Rouge plant.

There also will be a separate election for approximately 400 patternmakers at the Rouge plant. All wood and metal patternmakers will have a choice between the Pattern Makers League (AFL), the UAW-CIO or neither.

The election will be under the direction of Russell R. Miller, election examiner from the NLRB in Wash-





WHILE no dollar estimate of the damage done to machinery and equipment during the strike has been given out by the Ford Co., it is believed to have considerably exceeded $100,000. Before the plant was finally evacuated, mobs roamed through it and broke machines such as the valve seat grinder and contour shadowgraph shown above and at the right. Two furnaces in the open hearth building collapsed from too rapid cooling. Some precision equipment awaiting installation in the new aircraft plant will have to be returned to the makers for repairs. Blitzbuggies and other government material remained on the production lines unfinished.

ington, who also conducted the big Chrysler and General Motors elections. First the company payroll, taking into consideration all exemptions, is submitted to the examiner, who goes over it for any clarification of a worker's status that may be necessary. Preparation of the payroll by the company may require two or more weeks.

In the case of the Ford election, the company has agreed to hold the election on company property and on company time. The company also will choose the polling places, subject to Miller's approval, and has agreed to build the booths, which follow City of Detroit specifications. Booths must not be in a superintendent's office nor near supervisory quarters. Otherwise, the site is left up to the management, which is more familiar with manufacturing routine and can decide which places are most convenient and least disruptive to normal operations.

Flood tide at famous Gate 4 of the River Rouge plant on re-opening day after "the late unpleasantness" had tied up defense contracts and made 118,000 Ford workers throughout the country idle.

The board endeavors to arrange it so that each polling place will have approximately 1500 voters. Thus, in the Ford election there probably will be between 50 and 60 polling places. Notices of the election are posted throughout the plant a week before the election. The voting schedule by departments is arranged by the company and posted. Due to the split shifts that operate at Ford, the polling places probably will be open from 5 a.m. to 9 p.m. on election day. All workers in line at closing time can vote.

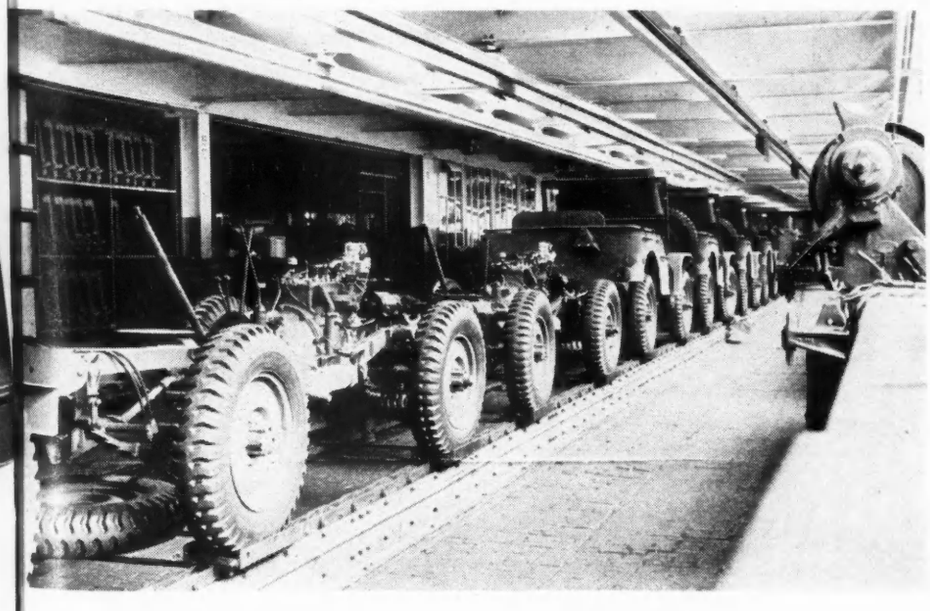
Each polling place is manned by two NLRB employes, one a regular board worker, many of whom are brought from outside regional offices due to the size of the poll, and the other a temporary employe hired for this particular election. However, due to the number of NLRB elections that have been held in Detroit over the past two years, a large number of experienced temporary employes are available.

Each union involved is allowed two observers at each polling place and the company is allowed two observers. Ballots are not numbered or initialed in any way to permit ascertaining how anyone voted. A complete polling list of workers and their badge numbers is given each polling place. When a worker comes to the table to vote, he gives his name and number to one of the company observers who handles the list. The company man is flanked by a member of the CIO and AFL. He calls out the name and the observers on each side both check it with a pencil. This is to forestall any repeating.

The worker is handed a ballot by the NLRB employe and enters the curtained polling place, marks his ballot, emerges and drops it into the ballot box on the table. If a worker wants an explanation of the ballot or cannot read, he can call upon one of the NLRB employes for help. The company and union observers are not permitted to help a voter. Ballots never are allowed out of the hands of board employes except when they are in the hands of the voters.

A voter's eligibility can be challenged by either company or union observers or by the NLRB representative if he thinks there is any question about the voter. In the case of a challenge, the voter marks his ballot as usual and then seals it in a special envelope without any distinguishing mark. The NLRB representative then puts that envelope inside a larger envelope, on which the voter signs his name and the board employe records the rea-

(*Turn to page* 502, *please*)



At the Johnson

By JOSEPH GESCHELIN

FOR THE first time since the inception of the monthly series of articles in AUTOMOTIVE INDUSTRIES dealing with automotive manufacturing establishments, we have an opportunity to present a first-hand study of the facilities of one of the foremost makers of outboard motors in the United States.

About five years ago, two leading outboard motor manufacturers—the Johnson Motor Co., Waukegan, Ill., and the Outboard Motors Corp., Milwaukee, Wis. — were merged into a single organization, the Outboard Marine and Manufacturing Co. Johnson also had a subsidiary in Peterboro, Canada, now a subsidiary of the new company; and a refrigeration line at Waukegan, later moved to Galesburg, Ill., now listed as the Gale Products Division of the new company.

This is the Fifty-ninth in the series of monthly production features

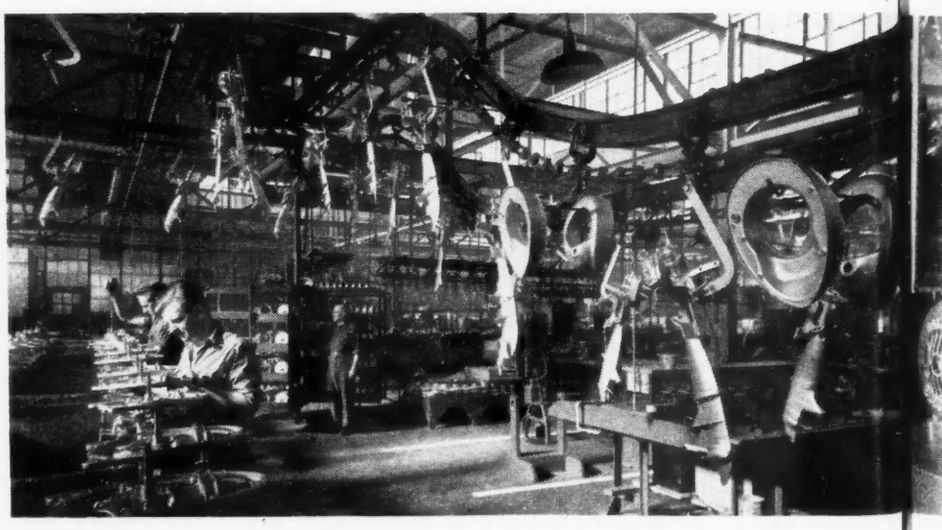
Johnson Motors is one of the four operating divisions of the new company, the complete organization comprising—Evinrude Motors, Gale Products, the Canadian division, the Johnson Motors.

Thus was born an unusual cooperative enterprise tending to pool and streamline the talents of sales, engineering, and manufacturing into a set-up of greatest utility to the users of outboard motors. In this program the sales and engineering departments are independent and operate on a free competitive basis. Production departments, on the other hand, have been welded into a closely cooperative activity which has had much to do with a general improvement of the product at much lower price levels.

In the realignment of manufacturing facilities of each of the divisions, the production of certain component parts was concentrated in plants where such work could be done most economically. Thus the Johnson Motors Division, which is the subject of this study, makes for all divisions such parts as pistons, connecting rods, gas tanks, and other detail parts. The other divisions, in turn, are responsible for the production of other parts for themselves as well as for other members of the Outboard family. Factory floor space in the Johnson plant at Waukegan is 165,000 sq. ft.

Happily, this business-like coordination of skills marked a profound improvement in the product so far as performance and service are concerned, and resulted in an appreciable reduction in sales prices. So much so, in fact, that the demand for Johnson Sea Horse motors has more than doubled in the past five years.

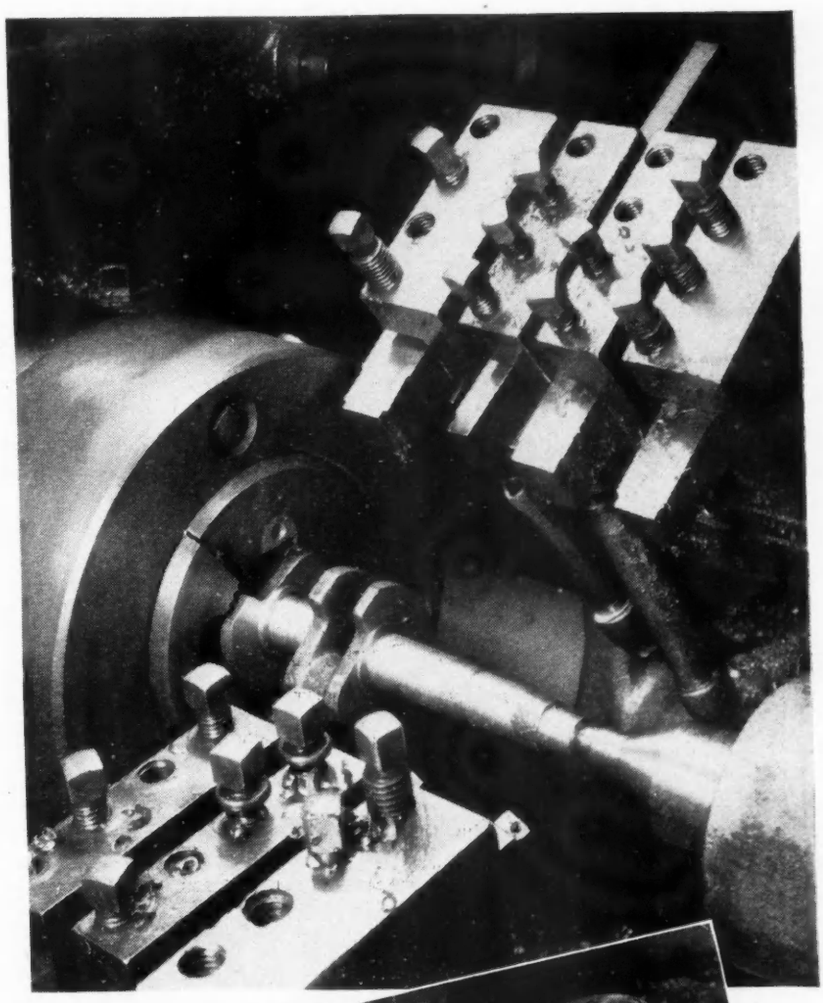
In this highly competitive field, the solution to the problem of cost reduction has been found in an exemplary coordination of engineering and manufacturing activities, in much the same way as it is found in other branches of the automotive industry. To cite but one example, the first step in the early stages of the program was the decision to make all of the major parts of the motors of aluminum die castings. To this end, each model of motor was analyzed minutely; then the component parts were redesigned



General view in main assembly department showing the overhead feeder line conveyor carrying component parts as well as the sub-assembly of the power head and lower unit

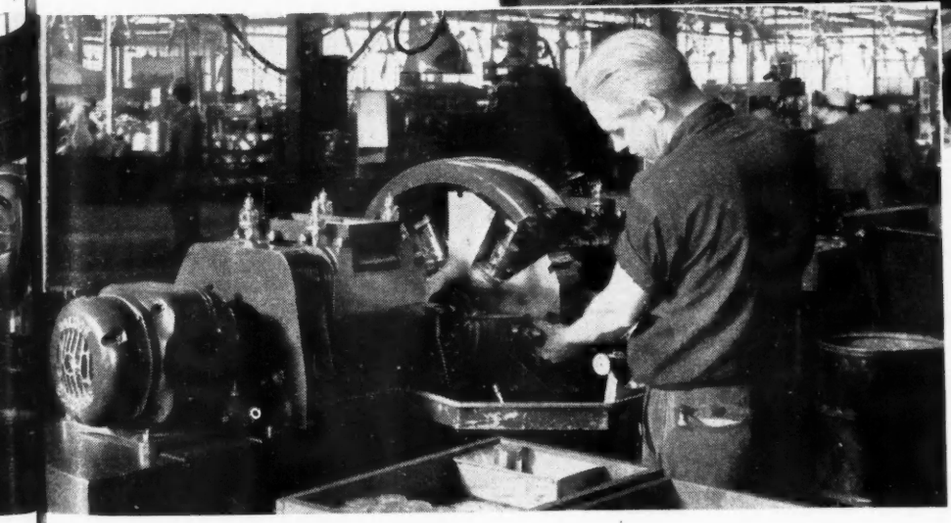
Plant

making outboard motors, are many features to speed production that apply to any automotive plant turning out a wide variety of small parts



so as to conform to the requirements of good die casting practice.

Quite logically this resulted in the establishment of an outstandingly modern aluminum die casting department in the Johnson plant. It is equipped with the latest types of Madison-Kipp die casting machines in sizes suitable for the production of a variety of parts used in the complete line of out-



(Top) One of a battery of Fay automatic lathes set-up for the machining of crankshafts

(Above) Wrist pin holes in pistons are inspected with the Pratt & Whitney Electrolimit gage, holding hole size to plus or minus 0.005 in.

(Left) Double-end Simplex precision boring machine with three heads on each side of the trunnion fixture is used for the boring of wrist pin holes in pistons. Two heads on each side rough and finish-bore, the third head being used for cutting the lock spring groove

board motors manufactured by this organization.

Looking at the Johnson operation in Waukegan, Ill., from the standpoint of the manufacturing executive, we find some interesting features which, in principle at least, apply to the problems of any automotive manufacturer concerned with turning out a wide variety of parts. In the first place, there is the adoption of flexible general purpose equipment wherever possible so as to permit the routing of a number of similar or even different part pieces over the same machines. This is expedited by the use of quickly interchangeable jigs and fixtures and tooling.

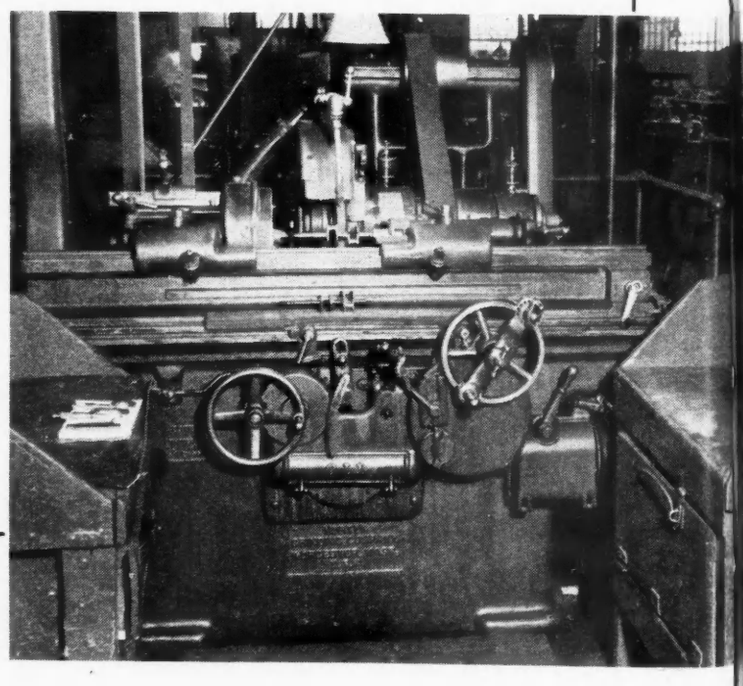
Consider a few specific examples. First is a centralized set-up for making aluminum gas tanks. All of the component stampings are blanked and formed on a single Verson press provided with the necessary interchangeable dies. Then there is a huge LaPointe vertical broaching machine equipped for hole broaching. In one set-up it is used for broaching the bores of small bushings, three at a time, with automatic indexing for rough and finish-broaching in the same setting. By changing the tooling, the same machine is used for broaching the bores in cast iron cylinder liners. One of those remarkably fast Imp lathes is tooled up for turning and facing bushings, handling the entire gamut of sizes on the one machine. Then there are several batteries of Delta drills, set-up in groups of four heads per unit, which are employed for the gamut of drilling and tapping operations.

On the other hand, certain specific jobs requiring specialized high speed techniques utilize single-purpose machines with features that would do credit to any mass production plant in the industry. This applies particularly to the Lo-Swing piston lathe which prac-

Factory Routing of Cylinder and Crankcase

OPERATION AND EQUIPMENT
SNAG to clean
REDRILL 2 holes for gas tank, 2 holes for steering bracket, **REDRILL** long and short water passage
MILL joint face 2 at a time Garvin mill
TAP 6 holes in crankcase joint face Haskins tapping machine
BROACH head face LaPointe broaching machine
ROUGH and **FINISH BORE, CHAMFER** and **RECESS** both cylinder bores No. 2 Gisholt lathe
MILL muffler face Milwaukee mill
REAM 1 hole, **DRILL** 1 hole 1½ in. deep x (1) 5/16 in. hole through angle holes 4 spindle Leland Gifford drill press
DRILL 9/32 in. through, **SPOT** No. 31, **DRILL** No. 3 2 3/32 in. deep, **REDRILL** No. 31—¼ in. deep and **SPOT** No. 31, **DRILL** No. 33 to meet, **REDRILL** No. 31 ¼ in. deep and **DRILL** No. 33 angle hole to meet No. 31 hole 4-spindle Delta drill press
DRILL (1) 1/32 in. angle hole to meet No. 33 hole and **SPOT** ¼ in. and **DRILL** No. 21—1⅝ in. deep and **TAP** No. 10—0/32 in. depth 1½ in. (1) hole 4-spindle Delta drill press
DRILL 4—13/32 in. holes, **DRILL** 2—17/32 in. holes, and **DRILL** 6—⅜ in. one side 4-spindle Leland Gifford drill press
DRILL 4—7/16 in. diameter holes, depth 3—11/32, **REDRILL** 2—9/16 in. diameter holes, dept. 3—11/32 in. and **REDRILL** 13/32 in. diameter through 6 holes 4-spindle Delta drill press
MILL 1.784 in.—1.788 in. diameter U. S. hand mill
REDRILL 13/64 in. diameter and **TAP** 2 holes 2-spindle drill press
ASSEMBLE aluminum plug
REMOVE BURRS from cylinder face and **DRIVE** 6 studs
REMOVE BURRS from faces and **ASSEMBLE** crankcase halves with 6 nuts and washers Bench
DRILL 3/16 in. through, **REDRILL** 19/64 in. through, **REAM** 2 holes, **REREAM** 2 holes, and **DRIVE** dowels 4-spindle Delta drill press
MILL D.S.C. face and exhaust pad Milwaukee mill
WASH
PRESS slow speed insert in crankcase
PRESS in oil insert, **DRILL** hole through oil insert, **REDRILL** through slow speed jet and **DRILL** 2 holes for dowel pins 4-spindle Delta drill press

OPERATION AND EQUIPMENT
ROUGH BORE and **REAM** bearing and **FACE** thrust faces and **CUT** grooves, **REMOVE BURR** from thrust faces with file No. 4 Gisholt lathe
DRILL 1 hole and 1 angle hole to meet, **REDRILL** No. 31 ¼ in. deep (1) hole and **DRILL** 1 hole and **DRILL** No. 60 to meet angle hole 4-spindle Leland Gifford drill press
CUT spiral oil groove, upper bearing Fischer oil groover
"ALROK" treatment to prevent corrosion
IMPREGNATE (apply air pressure)
BAKE
WATER TEST and **STAMP** Tank
REMOVE paint from faces and **BURR** faces
TAP 9 holes Leland Gifford with tapping attachment
REDRILL 20 holes, and **TAP** 20 holes 2-spindle Leland Gifford drill press
FINISH BORE crankshaft bearings and **TURN** pilot Heald Boremetic No. 72A
FLYBORE cylinder holes and **HONE** to size Flybore machine and honing machine
INSPECT



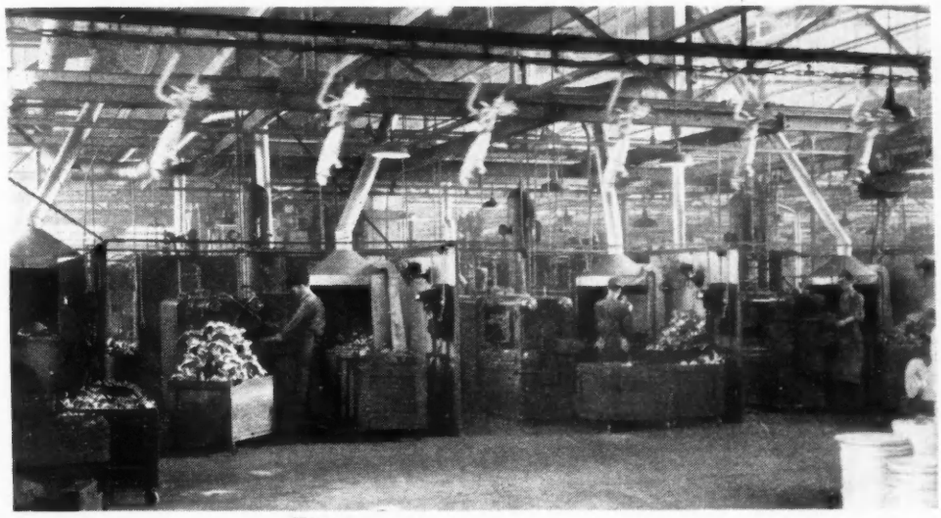
A Norton grinder finishing a crankshaft journal, one of a battery of Norton and Landis grinders in the crankshaft department

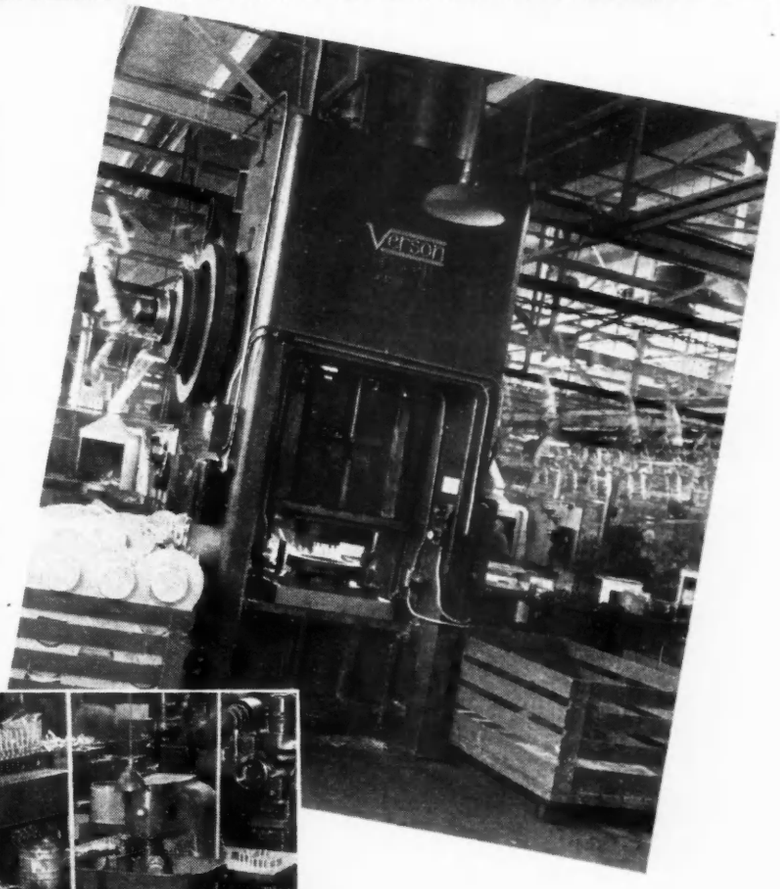
tically finishes pistons in one setting; and to the several Stokerunit Simplex precision boring machines for boring pistons and connecting rods.

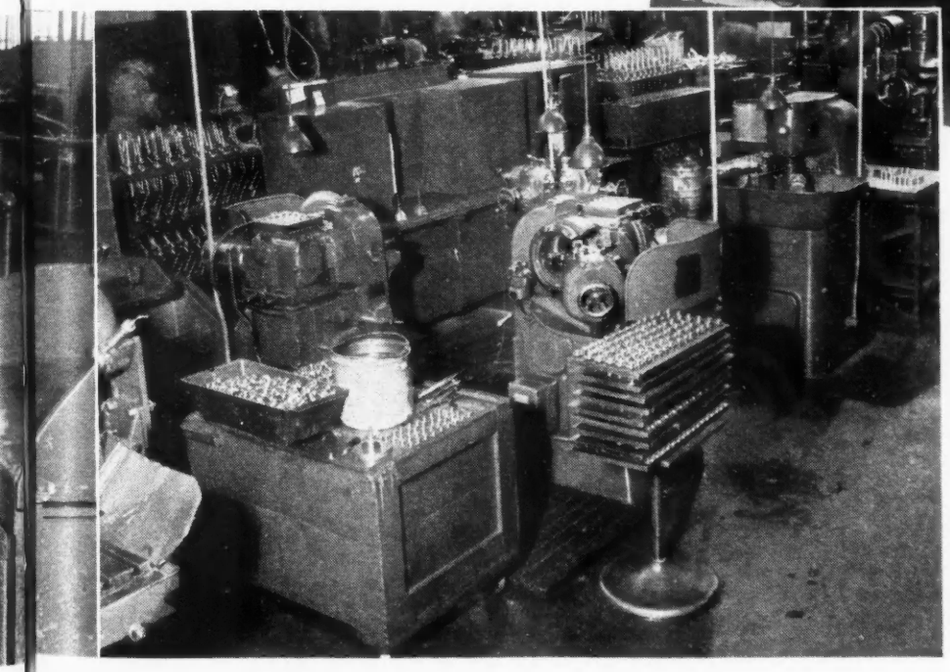
To the trained observer, an impressive characteristic of this operation is its similarity production-wise to the methods familiar in general automotive production. Despite the differences that might be expected because of small size or of the use of different materials, we find the same kinds of machinery—Potter & Johnston turret lathes, Gisholt lathes, Verson presses, Lo-Swing lathes, Simplex precision boring equipment, Heald grinders, Norton and Landis grinders, Natco drills, Delta heads, the Electrolimit gage.

Moreover, due to the wide use of aluminum alloys and cast iron, there are numerous examples of Carboloy tooling, many jobs being tooled exclusively with Carboloy.

Finally, the manufacturing program is expedited and held at economical levels with the aid of a magnificently equipped tool room. The tool room with its many items of modern machinery such as Monarch lathes, Milwaukee mills, etc., permits the management a free hand in planning for regular model changes and for detail improvements during a model season.







(Top) One of the bays in the die casting department affords a perspective of the line-up of the new Madison-Kipp die casting machines with the aluminum alloy melting pots adjacent to each machine

(Center above) The gamut of aluminum stampings for gas tanks and other parts are routed over this versatile Verson All-Steel press.

(Left) A battery of small Gleason bevel gear generators as well as a Gleason running-in machine are employed in the production of small bevel drive gears

Here is a glimpse of one of the gas tank assembly stations. The operator makes up the complete assembly of major stampings and inserts, preparing the various joints, applying the flux, etc., making ready for the brazing furnace

serts in the die, providing the long-lasting cylinder surface.

It is of interest to note that since the Johnson motor is of two-stroke type, the connecting rod has only a half bearing cast into the upper end of the rod, with no bearing in the cap.

Gas tanks for all motors are fabricated from special aluminum brazing sheet which is blanked, formed, and welded into a hermetically sealed cell. The bevel gears for the propeller drive are made from S.A.E. 4615 nickel-moly steel.

For the current season, Johnson steps forward with another fundamental technical advance, the development of a new magneto employing a tiny Alnico magnet bedded in a disk of die-cast zinc alloy. This was announced for certain models at the 1941 Motor Boat Show in New York. Here is another instance of close cooperation between engineering and manufacturing since the Alnico magnet replaces the heavy alloy steel ring magnet used formerly, permits the use of a small cast iron flywheel which is finished automatically on a new Potter & Johnston turret lathe.

Factory Routing of Flywheel

OPERATION AND EQUIPMENT

DRILL hole in hub, **ROUGH TURN** outside diameter, **ROUGH BORE FACE** Bottom, **RACE** rim and **FACE** hub, **ROUGH REAM** tapered hole, **FINISH TURN** outside diameter, **FINISH FACE** and **FINISH BORE, FINISH FACE** rim and **FINISH REAM** tapered hole
Potter & Johnston turret lathe

BROACH keyway
LaPointe horizontal broach

COUNTERBORE hub

TURN pilot, **FACE** top, **FACE** hub, **FACE** 45 degree angle, and **CUT** 2 radii
Sundstrand lathe

DRILL No. 7, **TAP** 3 holes and **BALANCE**
2 spindle Leland Gifford drill press

INSPECT before painting

PAINT brown

BAKE

TREAT specification No. 10

TREAT specification No. 8

INSPECT

Production Details

The cast iron flywheel is machined automatically on a Potter & Johnston 5-D-2, 9 in., two-spindle chucking type turret lathe, and is finished in five operations, in the

(Below) Typical of the sub-assembly benches is this intimate view of the flywheel magneto line which is entirely self-contained

The materials handling system is consistent with the volume of product, is mechanized only where conditions warrant special treatment. However, in the assembly department where it is both feasible and economical to have mechanized handling, there is an excellent coordination of the overhead feeder monorail and the assembly benches. In addition, there is a special mechanized system for handling final assembly as will be observed in the illustration.

Getting down to the details of the operation, let us look first at the materials employed in the construction of Johnson outboard motors. In the first place, the major parts—cylinder block, crankcase, connecting rods, pistons, mounting plates, gear case, and drive shaft housing—all are made of aluminum alloy die castings. In casting the cylinder block, cast iron sleeves are used as in-

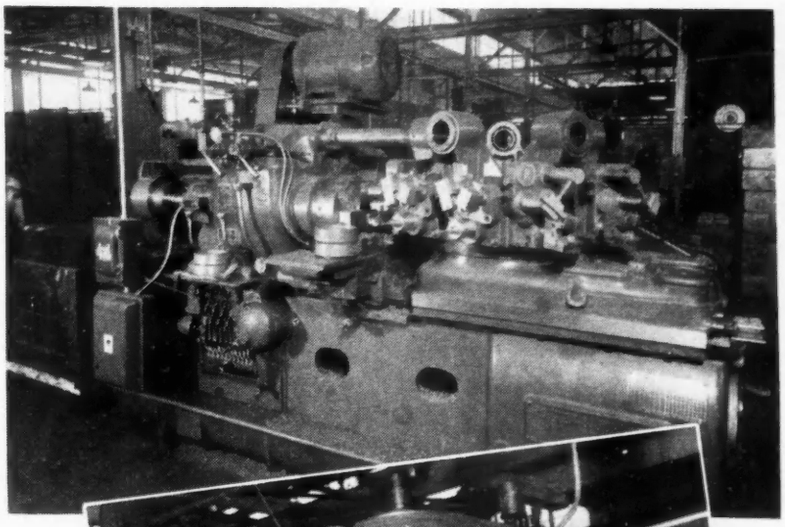
same setting as follows:

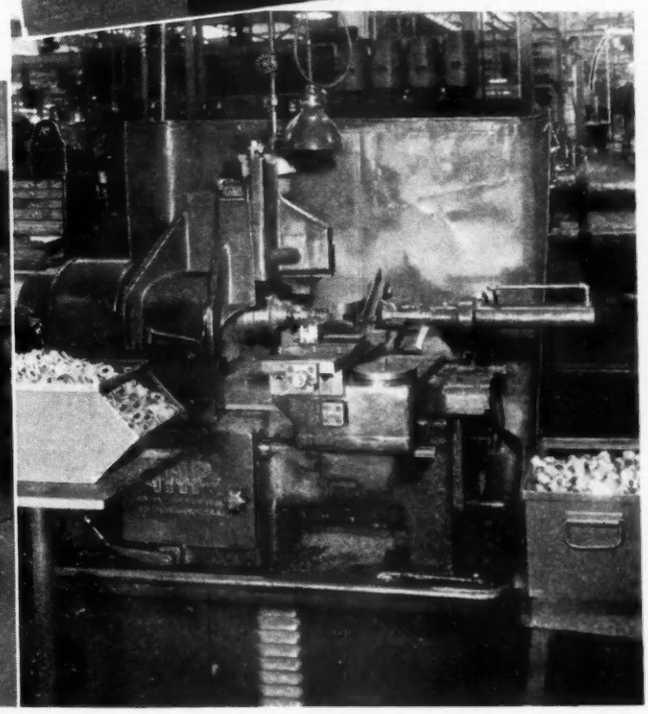
First T. face—drill hole through from solid
Second T. face—rough turn O.D., rough bore under rim, face shoulder at bottom, face rim, face hub
Third T. face—rough ream taper hole
Fourth T. face—finish turn OD, face and bore under rim, face rim, chamfer where necessary
Fifth T. face—finish ream taper hole

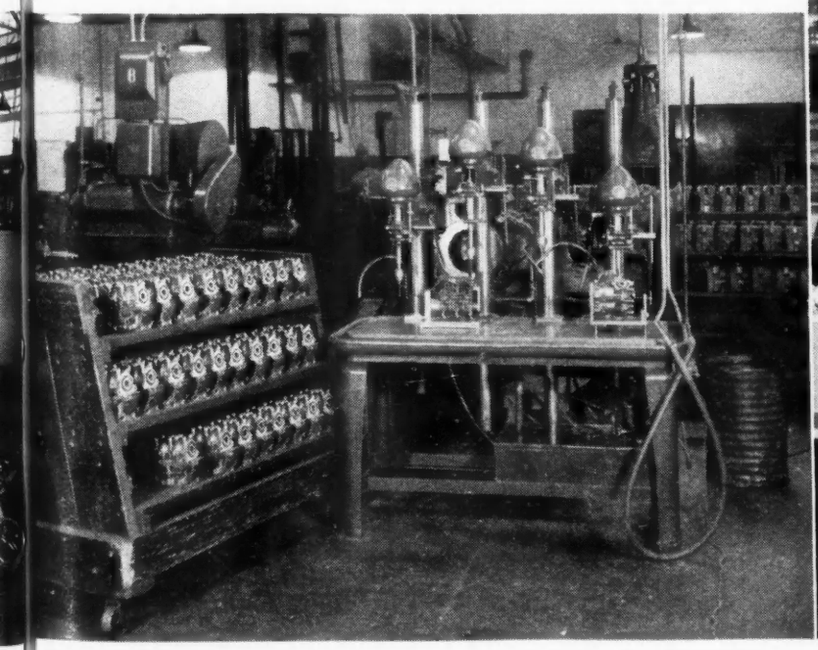
Cemented-tungsten-carbide tools are employed for this operation, the work having a surface hardness of 220 Brinell.

Two LaPointe vertical broaching machines are found here. The first of these is a type V-4 pull-down machine of 15-ton capacity with 54 in. stroke. It is used for hole broaching, usually with round broaches, for finishing the following parts—connecting rod bearings, cylinder sleeves, connecting rod bushings, inserts for the gear case, propeller shaft sleeves, top, bottom, and center main bearing bushings, propeller inserts, and pinion shaft bushings.

The usual set-up consists of an in-







(Top) Cast iron flywheels are finished completely in one setting on this Potter & Johnston two-spindle chucking turret lathe

(Center right) All holes in the big mounting plate are drilled automatically in this Natco multiple drill. Four Govro-Nelson high speed drilling and tapping heads, mounted on the table, come in automatically at a predetermined point in the cycle to take the horizontally located holes

(Lower right) Close-up of the high speed fully automatic IMP lathe for turning and facing a large variety of bushings

(Below) Here is one of the four-spindle Delta head drilling machines used for a variety of drilling and tapping operations

Factory Routing of Crankshaft

OPERATION AND EQUIPMENT
MILL to length Milwaukee mill
CENTER both ends De Whiton double head centering machine
ROUGH TURN and **ROUGH FACE** long and short ends center bearing and outside diameter of flanges and thread diameter Fay automatic lathe
FINISH TURN and **FINISH FACE** long and short ends center bearing, **FINISH TURN** outside diameter of flange and thread diameter, **FINISH TURN** taper Fay automatic lathe
FINISH TURN lower pin Fay automatic lathe
FINISH TURN upper pin Fay automatic lathe
THREAD long end Gisholt lathe
DRILL, REAM and **CUT** recess, **RECENTER** and **COUNTERBORE** short end Gisholt lathe
BROACH spline No. 3 punch press Loshbough Gordon
DRILL 2 holes in center bearing, and **DRILL** 2 angle holes on cheeks 4-spindle Delta drill press
MILL 2 keyways in long end U. S. hand mill
REMOVE BURRS from angle holes Bench
WASH
ASSEMBLE grommets and copper plate
POLISH to remove excess copper
PLUG HOLE in short end with asbestos and **PAINT** with local case on end only Bench

OPERATION AND EQUIPMENT
CARBURIZE
STRAIGHTEN before hardening
QUENCH to harden and draw
SANDBLAST
CHECK for hardness Rockwell instrument
RECHASE threads Bench
STRAIGHTEN and **CHECK THROWS**
LAP centers
ROUGH GRIND center bearing Norton grinder
ROUGH GRIND short end Norton grinder
ROUGH GRIND long end Norton grinder
FINISH GRIND crank pins Landis grinder
FINISH GRIND taper Norton grinder
FINISH GRIND cam Norton grinder
POLISH pins
CHECK for straight and **LAP** center (long end only) after polishing pins
FINISH GRIND center bearing Norton grinder
FINISH GRIND long end Norton grinder
FINISH GRIND for rotor Norton grinder
FINISH GRIND short end Norton grinder
POLISH bearings
Final **INSPECT**

dexing fixture holding six bushings with two sets of broaching tools, each set comprising three broaches, one set for rough-broaching, the other for finish-broaching. An electrically interlocking automatic fixture is employed for indexing the table from the rough to the finish broaching positions. Table movement is actuated by means of a small electric motor with a chain connection to the table.

This one machine, therefore, is flexibly tooled to handle all of the hole broaching jobs required in the plant. Broach cutting speed is 25 f.p.m., return speed 75 f.p.m.

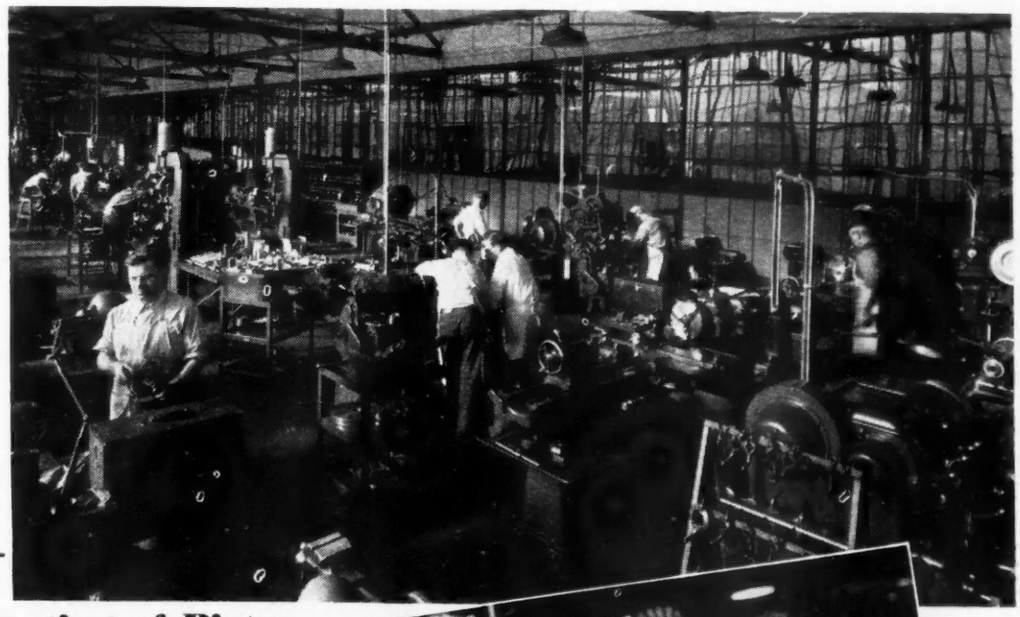
The other broaching machine is a LaPointe type V-2, rated 10-ton capacity with ram stroke of 42 in. This, too, is a vertical pull-down type machine but it is used exclusively for surface broaching operations, with a cutting speed of 25 f.p.m., return speed of 50 f.p.m. It handles the broaching of surfaces and faces on about 30 different parts, employing a minimum number of broaching tools by so selecting the work as to make it possible to use the same set of tools for eight to ten different parts. Here then is a single general purpose machine which permits the centralization of a large number of operations normally requiring routing over a battery of milling machines.

A number of miscellaneous operations are worthy of special attention. For example, here is a small space devoted to the manufacture of the small bevel gears. Gear teeth are cut on a battery of small Gleasons, bores are finish-ground on a familiar Heald Gage-Matic grinder.

The mounting plate—which fits on the top side of the motor for supporting the gas tank and other parts—is drilled in one setting on a Natco multiple drill which, in addition to the multiple drilling head, has

Pistons are machined completely in a single setting in a special automatic IMP lathe. This is a close-up of the work-station showing the tool slides

A close-up of one of the bays in the new tool room



(Center right) Taking advantage of the small size of the motor, a complete crankcase and cylinder block assembly is mounted for the line grooving of main bearings in a Wicaco continuous oil grooving machine

Factory Routing of Piston

OPERATION AND EQUIPMENT

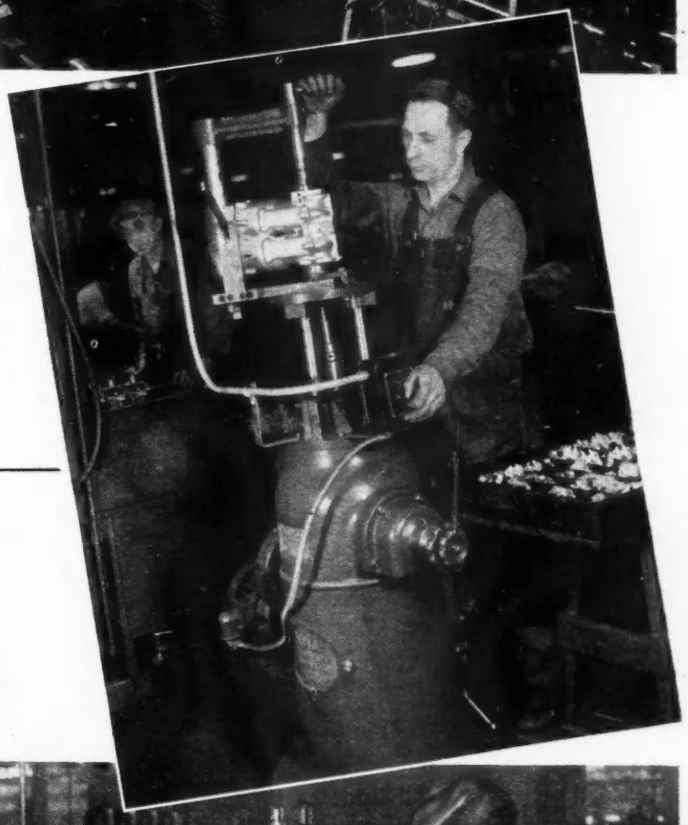
ROUGH TURN outside diameter
Gisholt automatic

SPOT one side of wrist pin hole to be bored to slip fit
Single spindle Leland Gifford drill press

CENTER and **FACE** skirt end, **CENTER** top end, **SEMI-FINISH** and **FINISH TURN** outside diameter and **CHAMFER** skirt end, **ROUGH** and **FINISH TURN** deflector, **ROUGH** and **FINISH TURN** ring grooves and **FACE** skirt end
Lo-Swing automatic piston machine

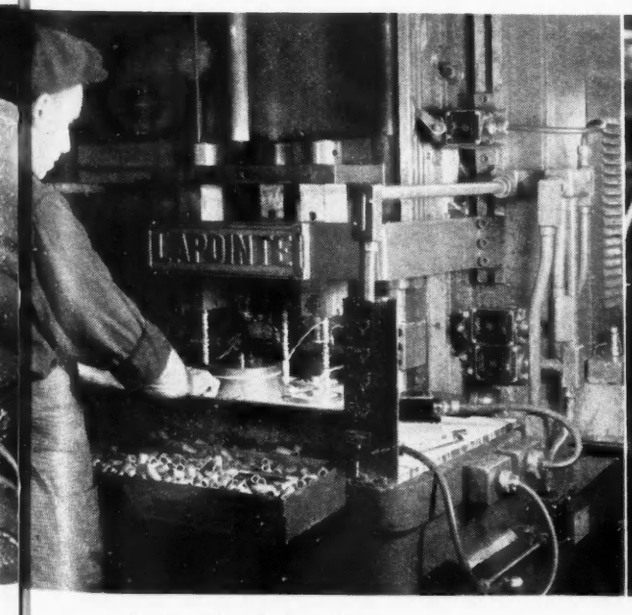
ROUGH and **FINISH BORE** wrist pin holes, **CUT** lockring grooves and **CHAMFER** wrist pin holes
Stokerunit precision boring machine

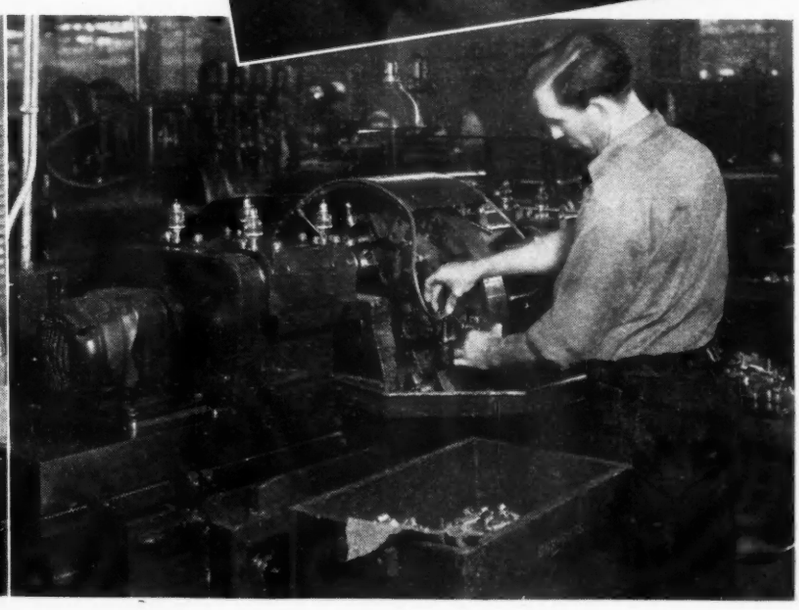
Final **INSPECT**



(Lower right) Both ends of the tiny connecting rods are precision-bored, simultaneously, in a special Simplex precision boring machine. The trunnion type fixture holds six rods on each side, making it possible to handle two different rods at the same time

(Below) The big Type V-4 LaPointe down-pull broaching machine is another of the general purpose machines in this plant. It is used for the broaching of a large variety of bushings and cast iron cylinder sleeves





four Govro-Nelson high speed drilling heads mounted on the side to take some special horizontal and angular holes. The high speed heads come into action at a predetermined point in cycle by means of a solenoid control.

Following the practice found so economical in the industry in recent years, four-spindle drilling and tapping machines as well as special arrangements of drilling heads are made up by mounting Delta drills on suitable bases. The specific uses of these machines will be noted by reference to the routings reproduced elsewhere in the article.

Another set-up once familiar in the industry, is that of the Wicaco continuous grooving machine which is used for machining the oil groove in crankshaft main bearings.

Now referring to the sampling of factory routings, consider the connecting rod. Principal operation is that of fly-boring both ends of the rod in a Stokerunit Simplex precision boring machine. It is fitted with a drum type fixture with six stations on each side, holding 12 rods at a time. The machine is so tooled as to take the entire gamut of rods required for Johnson and other divisions.

This machine is of double-end type with boring heads and boring head drive motor mounted on the heavy cast iron table. A hydraulic feed for the table coupled with suitable electrical controls provides a fully automatic cycle—rapid approach synchronized with the starting of the head drive motor, coarse feed, fine feed to a positive stop, dwell to clean up cut or for facing, spindle stop, rapid return to starting position.

A six-station trunnion fixture is mounted on the bed between the two boring units. It is so designed that interchangeable locating blocks and clamps mounted on its sides serve to handle the variety of connecting rod sizes. Since the fixture has two working sides, it is feasible to process two different types of rods at the same time. In detail each of the opposed tables is fitted with two precision heads, one for the small end of the rod, the other for the big end.

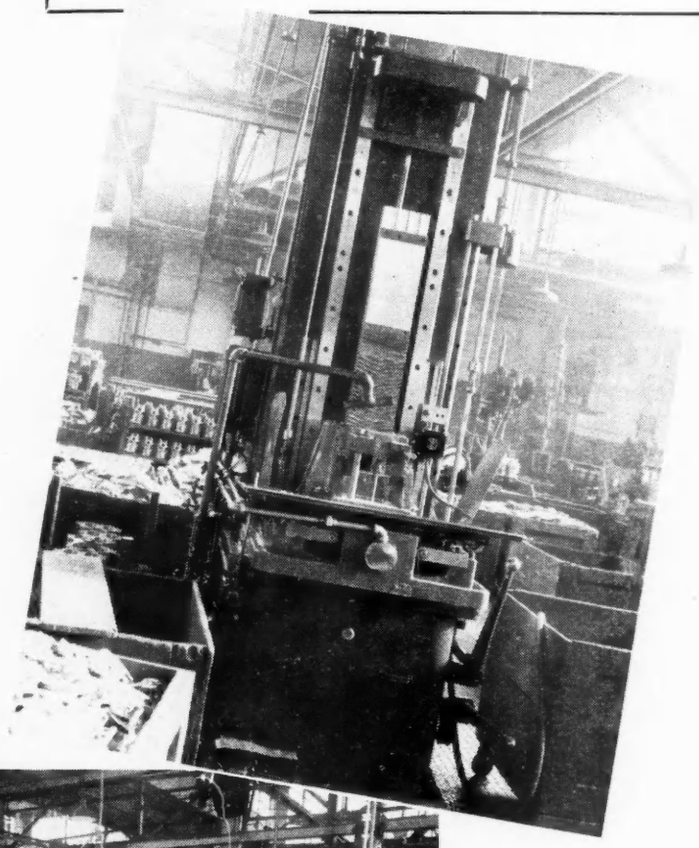
Easily one of the most spectacular operations in this plant is the procedure for making pistons. It is amazing to learn that they produce pistons starting with the aluminum alloy base

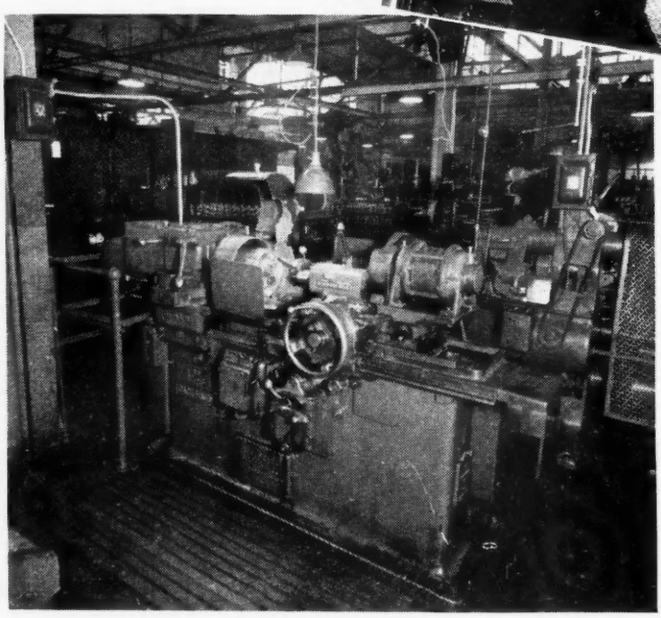
(*Turn to page* 500)

Factory Routing of Connecting Rod (Die Cast)

OPERATION AND EQUIPMENT

TAP 2 holes
Procunier tapping machine DP 220 single spindle
DISK GRIND rod and cap joint faces
Disk grinder
ASSEMBLE cap and rod (2) screws
DRILL ¼ in. hole wrist pin end
Single spindle Leland Gifford drill press
FLYBORE both ends
Strokerunit precision boring machine
SPOTFACE both sides big end
Single spindle Leland Gifford drill press
CUT radius both sides big end
Single spindle Leland Gifford drill press
CHAMFER both sides small end
Bench
STRAIGHTEN
WASH
INSPECT



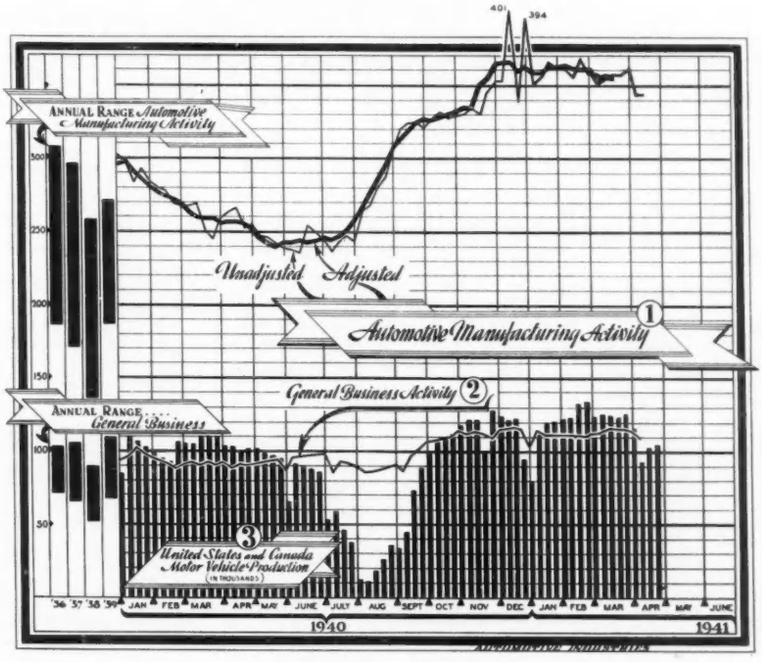


(Above) Another of the versatile general purpose machines found here is the type V-2 LaPointe down-pull broaching machine tooled for the surface broaching of faces and flanges of over 30 different parts

(Left) Heald Gage-Matic precision grinder is used for finishing the bores of small bevel drive gears

BUSINESS IN BRIEF

[*Our own view of automotive production and sales; authoritative interpretation of general conditions*]



Weekly indexes of automotive general business charted

Auto Curtailment Set on Over-all Basis Only

PROSPECTS of a 4,000,000 unit output in the 1942 model year due to agreement by the automobile manufacturers to cut production by 20 per cent because of the National Defense emergency and the abandonment of plans for 1943 model changes by General Motors were the major developments in the industry for Aprii. After a meeting with leaders of the industry in Washington April 17, W. S. Knudsen, director of the OPM, made the following announcement:

"The entire industry willingly accepted an initial 20 per cent reduction in the production of motor vehicles for the model year beginning August 1 this year, in order to make available more manpower, materials, facilities and management for the defense load now being made ready. The reduction will amount to approximately 1,000,000 units."

Production for the 1941 model season is estimated at 5,000,000 units, which will rank it second to 1929 with a record total of 5,539,090 vehicles. Even a 4,000,000 output for 1942 model year would make it the ninth biggest model year in the industry's 41-year history. It is understood that quotas will be assigned to each company for the first six months, up to Feb. 1, 1942, which lends credence to the belief that a further cut in output then may be imposed if the Government decides that National Defense conditions warrant it. During the first World War, a 30 per cent cut in passenger car production was imposed in March, 1918, and this was boosted to 50 per cent in June, lasting until the Nov. 11 Armistice.

[1] 1923 average = 100; [2] Prepared by Administrative and Research Corp. of New York. 1926 = 100; [3] Estimated at the Detroit office of AUTOMOTIVE INDUSTRIES.

Details of the curtailment program remain to be worked out between the manufacturers and the OPM. In Washington, it was stated that manufacturers are preparing recommendations to effect the plan, and indications are that all details, which will be submitted to the OPM, War and Navy department authorities for approval, will not be completed until the forepart or middle of May.

While Mr. Knudsen did not amplify his announcement, it was reported at other OPM sources that the cut of 20 per cent in production was an overall figure. The reduction would not inflexibly apply to each passenger car, truck and bus unit or type, but where a manufacturer is making various kinds of vehicles, he may reduce output of one kind by more than 20 per cent and another by less than that amount so long as the net reduction is 20 per cent. On the other hand a maker of only one kind of vehicle, such as passenger cars, would be required to make a flat reduction of 20 per cent, though it was stated that it need not be a uniform cut as to types and models. It was not made clear whether in the case of subsidiary producers, each unit of the holding company would be required to make a cut of 20 per cent or whether one subsidiary could be called upon to make a greater reduction than another.

The reduction program is looked upon as being much broader than is seen on the surface. In some quarters it was interpreted as an approach to a widespread and realistic conservation policy—a switch from butter to guns, or from the business-as-usual

(*Turn to page* 499, *please*)

Chassis and Body Structure o

REPRESENTATIVE of modern bus structures is the skeleton shown in Fig. 1—a 31-seat model with a frame composed entirely of pressings of high-tensile steel, arc-welded together. This bus has a chassis frame of exceedingly light design, upon which the body frame structure is built to form a single girder structure in which all members are structural and in which the stresses are well distributed. The whole design is worked out on the rectangular-lattice principle, and the various members are functional in form.

Over the chassis-frame members are laid light cross bearers, which support and protect the plywood floor. The floor is arranged in small panels, to reduce the unit bending loads and allow for expansion and contraction. Door and window posts are welded to both the chassis outriggers and floor cross bearers, and they are also joined to the roof carlines to form continuous hoops. These hoops are joined by longitudinal rails at the skirt bottom, floor level, seats, belt, letterboard and at three positions on the roof.

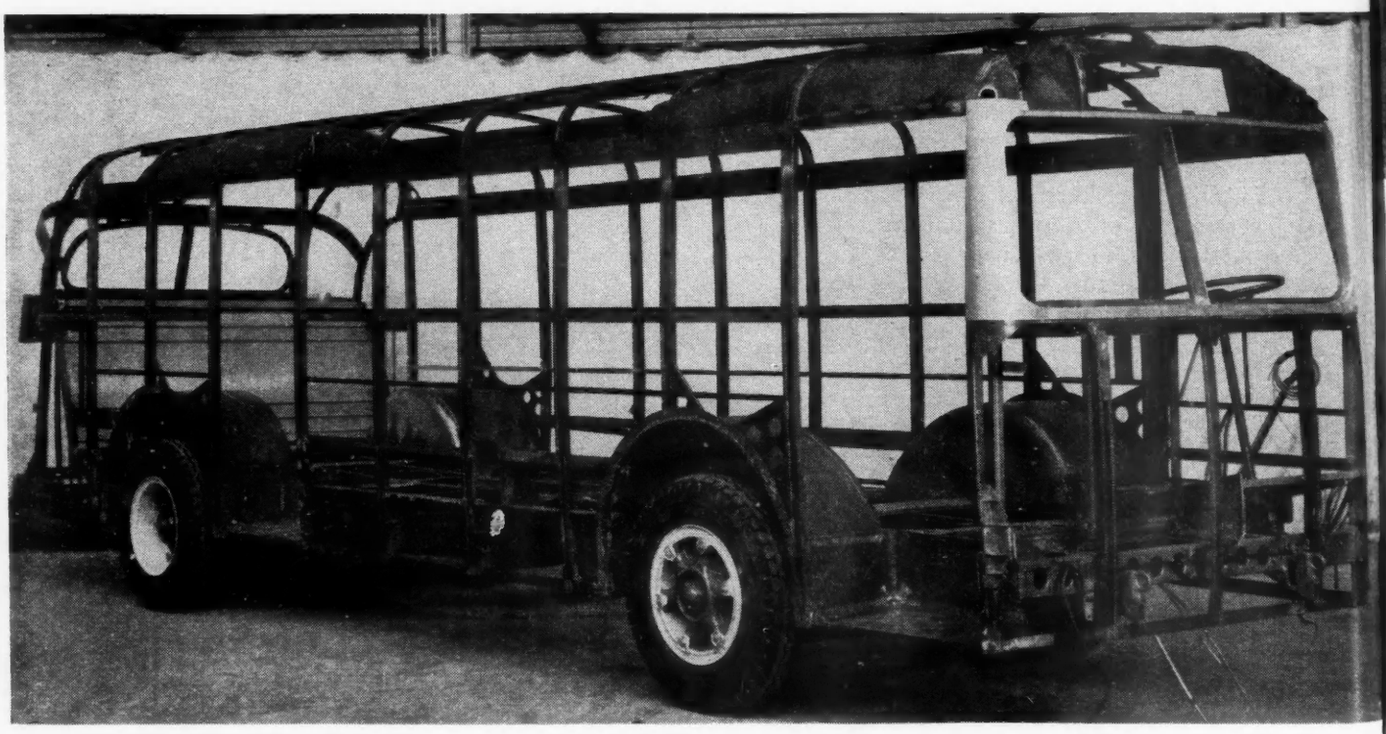
At the door openings there are truss plates above and step-wells below, the latter being of very staunch construction and forming essential parts of the structure. Wheel housings also are structural, and are tied in directly with the main-frame cross members that carry the spring brackets.

Fig. 2 shows the chassis with its light welded frame; it shows the locations of the widely-spaced side members, and how the cross members and outriggers form full-width cross bearers in the same plane as the side members. This also shows the simple ramp-form of chassis frame, which is designed to conform to the shape of the floor, so that no filler blocks are needed.

Fig. 3 shows the skeleton from within, looking toward the rear, showing the engine compartment bulkhead and the rear wheel housings. The large radius on the inner edges of the housings adds greatly to their stiffness, and it also improves their appearance from the inside. The flat panels between the wheel housings provide support for the floor, effective stiffening, and serve as a guard over the hand brake carried by the third member of the rear-axle carrier. The posts are welded at their bottoms to the cross bearers, to the numerous rails, and to the roof carlines. The posts, like the carlines, are of flanged U section, with outward flanges providing a broad supporting surface for the outer panels and a neat and self-contained interior aspect. As shown in Fig. 4, the open channels of the posts are closed by broad plates clinched over the edges of the flanges, and spot-welded. A special connecting channel

* Abstract of an S.A.E. paper by Merrill C. Horine and Harry S. Bernard of Mack Trucks, Inc.

Fig. 1—Modern 31-passenger bus in skeleton form



# of a Modern Bus

telescopes between the post and carline and is located at the edges over a considerable portion of its length. The letterboard rail is continuous and has a rectangular perforation to pass the post. Being of flanged-channel section, it provides effective stiffening at this vital joint. The other rails are of similar design, and all are arc-welded in place.

Two of the longitudinals in the roof are combination ventilating ducts and dome-light conduits; they are shown in greater detail in Fig. 5. The ducts are part of the fresh-air ventilating system which is standard on this model; they form a convenient mounting for the dome lights and an accessible conduit for their wires. At the same time they perform an important structural function by stiffening the roof.

Referring back to Fig. 3, it will be seen that the small box over the exit door also is an essential part of the structure, assisting the truss plates above the door in reinforcing this opening. This box is too small to house the door engine (which latter is mounted at floor level) and it encloses only the chain-and-sprocket connection between the two door shafts and the emergency valve.

A good example of multi-purpose functional design is afforded by the front header of the body, a fragment of which is shown in Fig. 6. This member constitutes the front of the roof, the top of the windshield,

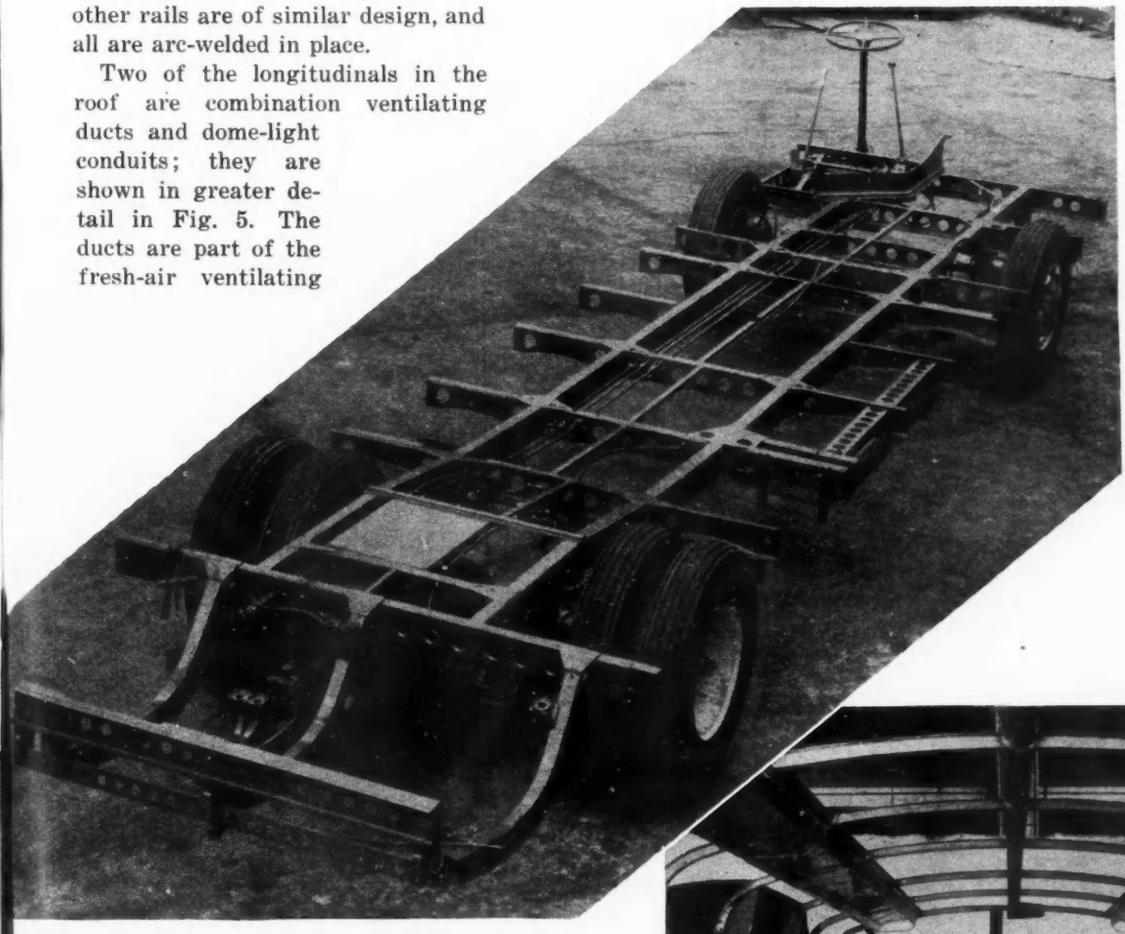


Fig. 2—Bus chassis with light welded frame

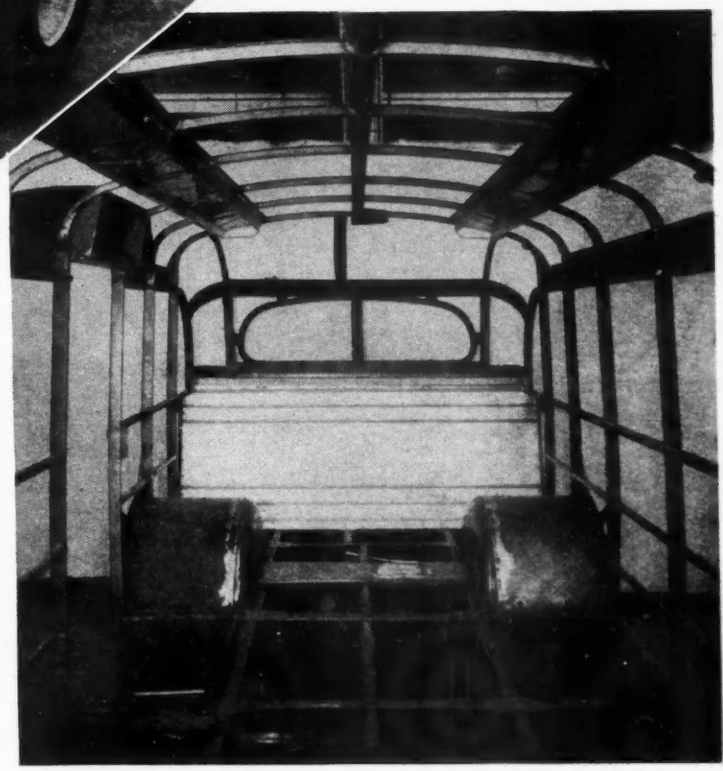


Fig. 3—View inside of skeleton bus, with engine-compartment bulkhead in background

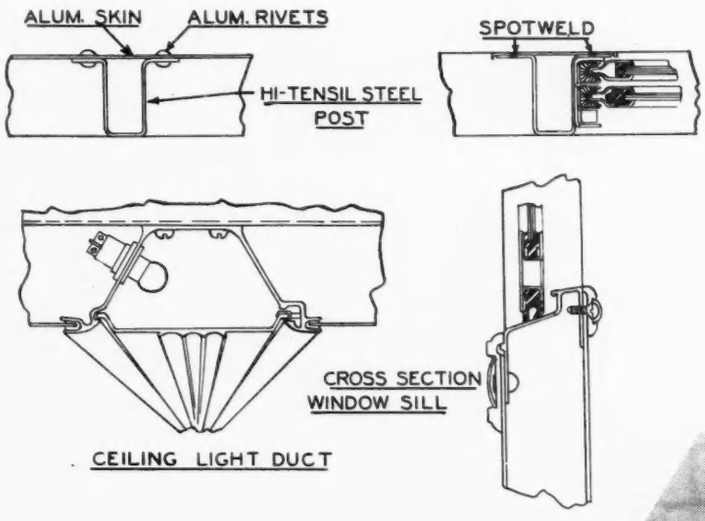


Fig. 4—(Center) Detail of frame construction, showing flanged channel-section post, roof carline, junction between the two, ventilating duct, and roof lining

Fig. 5—(Top) Further details of frame and roof construction including window sill and ceiling light duct

the main tie between the tops of the front body posts, the box for the destination sign, and the intake ends of the ventilating ducts. With all of its multiple functions, it is a simple assembly of light-gage high-tensile steel, fused together. Its curved lower surfaces, moreover, require no covering other than a coat of paint.

Functional design is particularly well illustrated in Fig. 7, which shows the rear-end framing. Each of the parts conforms closely to the body exterior, and at the same time it contributes to the strength and rigidity of the frame. The rear-window frame, for instance, is so formed as to constitute most effective corner bracing for the window opening, and yet it is shaped to receive the window glass directly. The dividing bar is also an important structural unit, transferring the tension from the outer end of the heavily-loaded center engine bearer directly to the ridge rail of the roof. The center post of the engine compartment has been removed, while in the completed bus it is bolted firmly in place.

Fig. 7 also illustrates the arrangement for mounting the powerplant. The problem here is to support a heavy assembly giving rise to high reaction forces, by a cantilever structure. At the bottom there are three die-formed cantilever arms, welded to two frame cross bearers at their forward ends and bolted to the bumper support bar at their rear ends. Suitable supports for the six rubber mounting cushions which support the powerplant are provided on the center and right arms, the left arm being used to support the radiator. The bumper-support bar and the tie bar just above it are bolted in place and are removable, the same as the vertical bar, which latter is not shown. All of these bolting points are provided with wide gussets, to spread the bolt centers over a wide area, thus distributing the stress and ensuring firm, durable joints.

Just how an embarrassing opening in the body side may be made as stiff as the closed portion without undue weight or complication is illustrated in the construction of the front step well, which can be seen in Fig. 1. Every part of this step well is structural, and the whole is firmly welded to the chassis side rail, two outriggers, two posts, the front skirt rail, and the front wheel housing. Large-radius fillets stiffen it greatly, and contribute to appear-

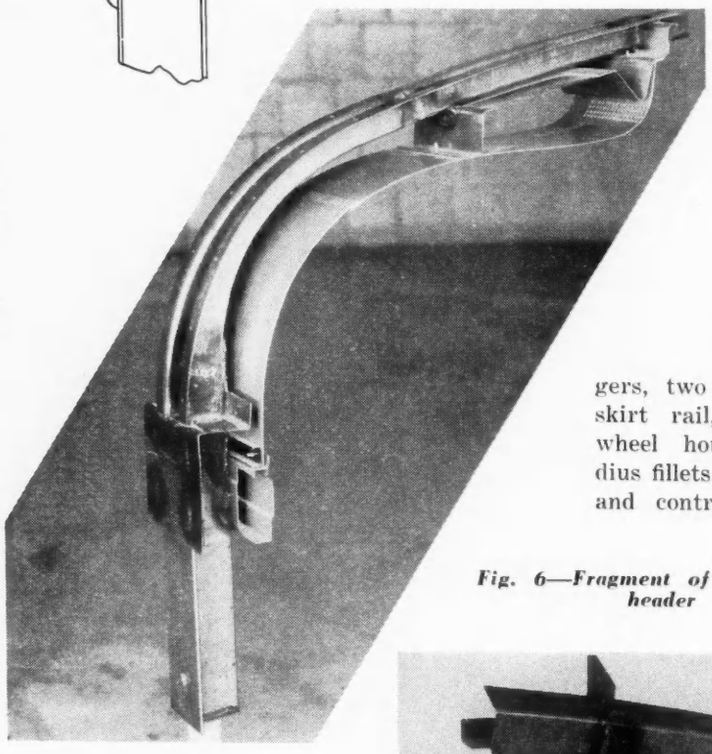
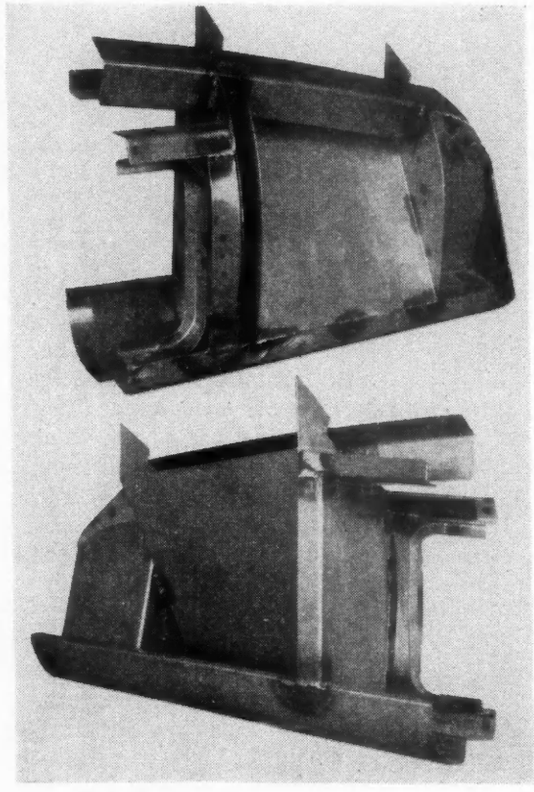


Fig. 6—Fragment of body front header



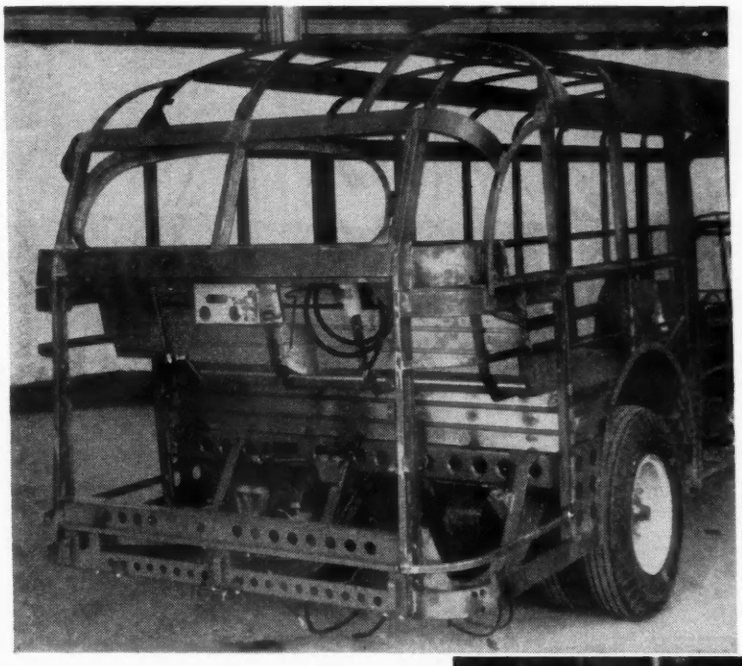
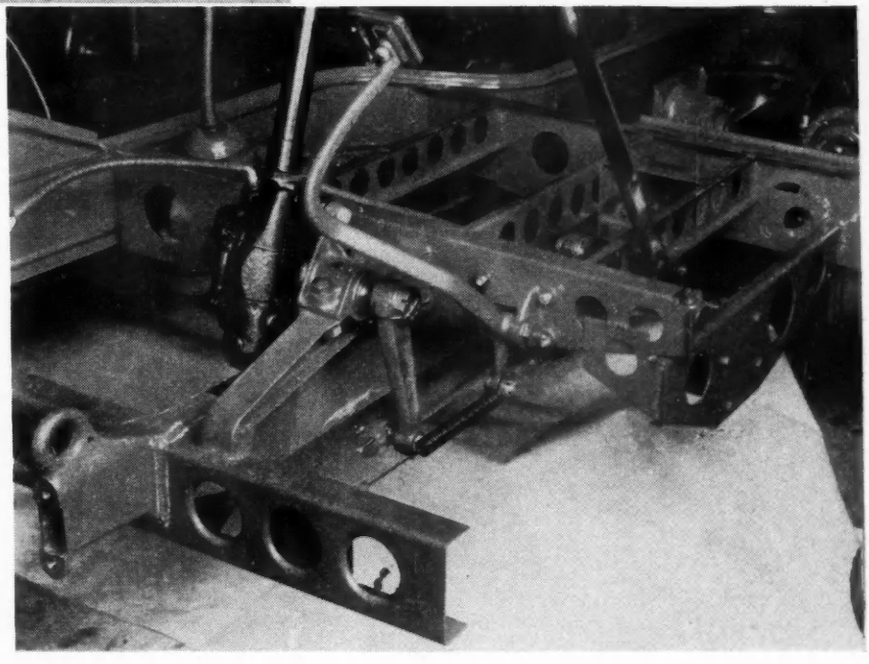


Fig. 7—(Above) Rear-end framing showing arrangement for power plant mounting

ance and sanitation as well. The tread is reinforced by channel-shaped rails underneath. A break in the right-hand door post passes the operating rod for the door engine, from its location back of the dash panel. A steel casting, which is firmly welded on both sides of the break, also serves to brace a gusset to the bumper backing rail. An example of simplified construction achieved through multi-purpose functional design is afforded by Fig. 8. Here we see the front bumper backing rail made to serve also as the front cross-bearer of the frame, the steel casting which supports the bumper serving also as the towing eye. Another casting which serves as the main fore-and-aft stiffening member of the driver's platform structure affords an extremely staunch trunnion mounting for the steering gear. The mounting of the clutch pedal also shows an interesting simplification which provides the utmost in ruggedness.

An example of distribution of stress is afforded by the cross bolster upon which are mounted the spring brackets and which serves to distribute the load to three of the main longitudinals as well as to both front wheel housings. Directly above this member is a floor cross-bearer tied in all rails and thereby forming a girder of great section modulus.

Fig. 8—(Below) Front end of frame showing bumper rail serving as cross bearer



The Earth's Share of Solar Radiation and What Becomes of It

ALL OF the energy used for the propulsion of motor vehicles came from the sun in the first place. It is part of that fraction of the sun's radiation which strikes the earth and which is stored chemically in some form or other. In delivering the Thomas Hawksley lecture before the Institution of Mechanical Engineers in London, Prof. A. C. G. Egerton said that radiant energy reaches the earth from the sun at the rate of 2.3×10^{14} hp., this being only about one two-billionth of the sun's total radiation. He considers the effective input of solar energy into the earth to be at the rate of 1.3×10^{14} hp., as some of the energy received is wasted by the tides, by lightning, etc. A rough estimate of the energy assimilated by plant life is 3.0×10^{10} hp. The power corresponding to the present rate of consumption of coal and oil is about 2.0×10^{9} hp., and the potential hydro-electric power about 3.2×10^{8} hp.

Coal, petroleum and natural gas are being consumed at the approximate rates of 1450 million, 276 million, and 55 million tons per year, respectively, and Professor Egerton figures that if these rates of consumption were maintained, the reserves readily available would not last longer than 1000 years. It seems quite likely, however, that the expense involved in producing the last remaining coal and oil and making them available where they are required, will cut the practical duration of the supplies materially.

MEN and

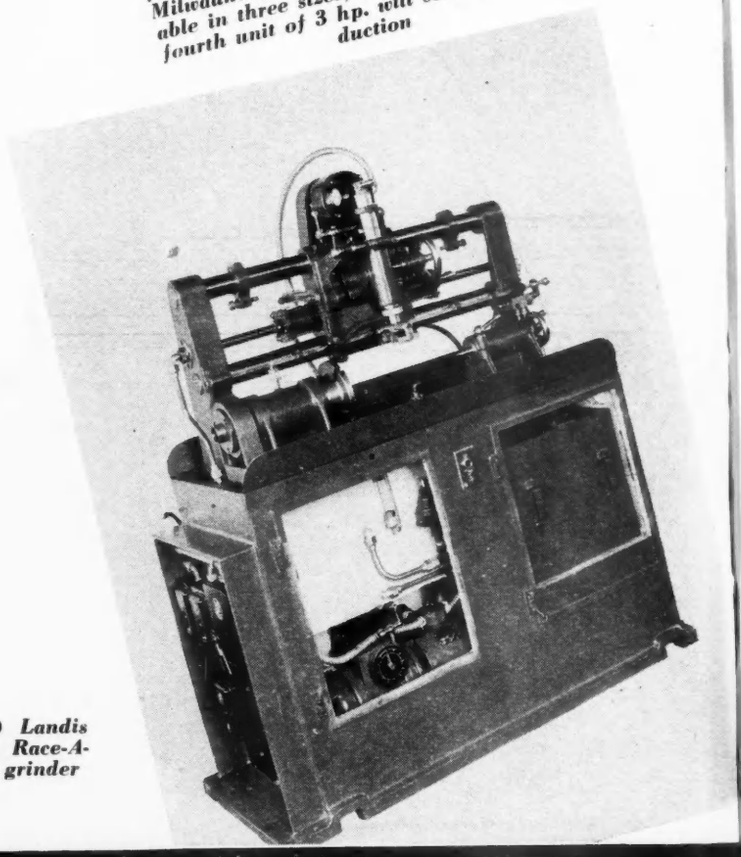
A COMPLETELY new machine has been developed by the Landis Tool Co., Waynesboro, Pa., for the production grinding of the raceways of small ball bearing outer races. It is designated as the No. 1 Race-A-Way Grinder and is intended for the smaller races to No. 204 size, inclusive. Double row races may also be handled.

The machine is equipped with the Landis-Solex sizing device which, in combination with an electric timing device, permits the performance of three operations automatically during the same grinding cycle. The race is rough ground up to the point where only a small amount of stock is yet to be removed. Grinding continues, but at a slower grinding feed. With the work practically to size, grinding feed and work head oscillation stop. The work head is centered and for a fixed but exceedingly brief period of time the wheel operates until the work is down to exact size.

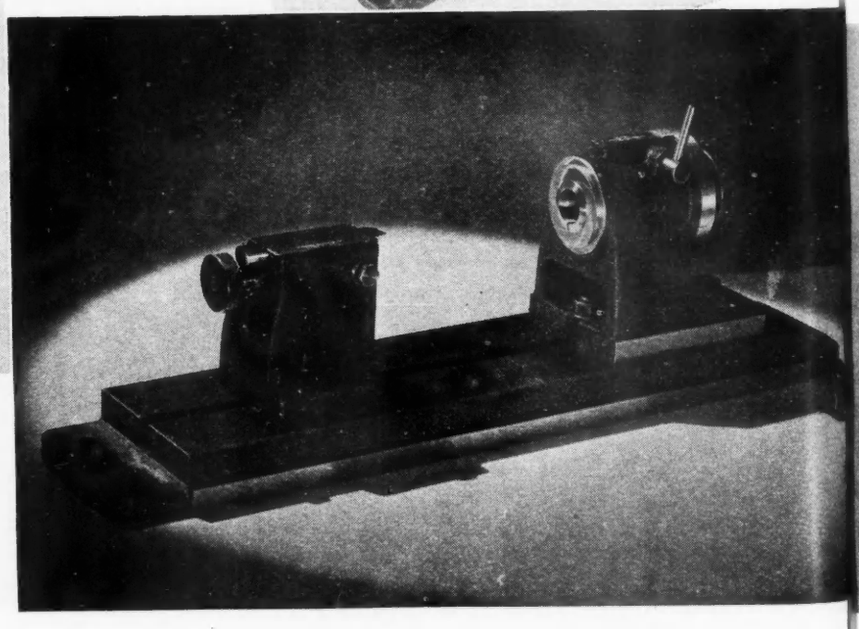
Standard equipment includes complete electrical equipment and everything required for the grinding of raceways within the capacity of the machine except the work holding chuck. The Landis diaphragm chuck is recommended and it may be had in two sizes. The net weight, including electrical equipment, is 3500 lb. The required floor space is 35 in. by 41 in.

NEW products of Hardinge Bros., Inc., of Elmira, N. Y., include a horizontal collet index fixture and a tailstock for use in tool rooms and in inspection departments. Their interchangeability makes it

This Foster Superfinisher is equipped with a variable speed transmission manufactured by Graham Transmissions, Inc., Milwaukee, Wis. Graham units are available in three sizes, ⅛ to 1½ hp., and a fourth unit of 3 hp. will soon be in production



(Left) Landis No. 1 Race-A-Way grinder



(Right) Hardinge horizontal collet index fixture and tailstock mounted on sub-base

MACHINES

possible to use them individually or in combination for direct application or with a sub-base on milling machines, grinders, shapers and drill presses. The horizontal collet index fixture takes standard 5C Hardinge collets with 1-in. round stock capacity. It is made in two model, H-4 and H-0, the former having an index plate with 24 holes and the latter a 20-hole index plate.

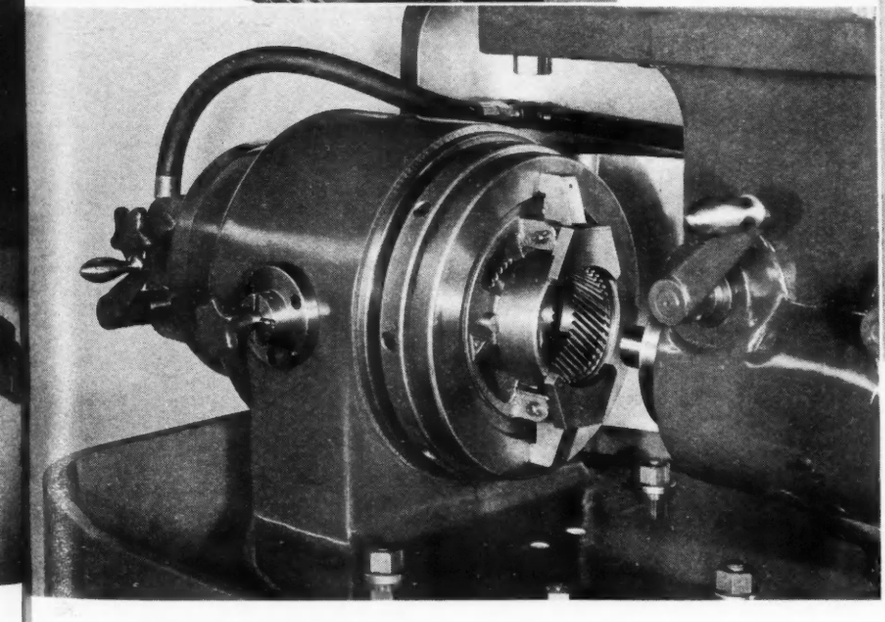
The company also makes a sub-base, SB-4, which is designed especially for its products. Two of the tailstocks can be used on the sub-base to make a centering device for testing of work between centers.

Dalzen vertical thread grinder

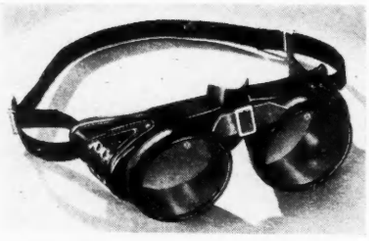
DALZEN TOOL & MFG. CO., Detroit, has started manufacture of a vertical thread grinder, which is a departure from the conventional design of thread grinders. Instead of approaching the work from the side, it is approached from above. In this position the head is directly over its own base and thus maintains a constant equilibrium.

Being in an upright position the Dalzen machine conserves on floor space, occupying 38 in. by 48 in., and is 75 in. high. It has a capacity of 18 in. between centers, 6 in. in diameter, and can produce 10-in. length threads any place on an 18-in. shaft, right or left hand, with the same lead screw. The head pivots and can be set accurately to a maximum of 25 degrees either side of center to produce right or left hand threads of any standard or special forms. A master cam with an adjustable fulcrum block and pick-off gears provides for making a vari-

Federal snap gage of Model 264P series



Closeup of Michigan Tool Co.'s new internal gear finisher with gear in place. Cutter was removed to show installation more clearly.



Bausch & Lomb, Rochester, N. Y. new welding goggles, known as Arc Ban. Two models are offered, one to take care of workmen with corrective spectacles.

able relief on any number of flutes in taps.

A GEAR shaver of the cross axis type for finishing internal gears is announced by Michigan Tool Co., Detroit. It is called Model 860-B-I which, in contrast to gear finishers for external gears, provides for mounting the cutter on the head of the machine with the work located in a special driving fixture on the knee of the machine. During the shaving operation, the work is rotated while the cutter spindle reciprocates simultaneously, carrying the cutter back and forth over the gear teeth. Otherwise the cutter is free to rotate within the gear.

Special provision is made to locate the work accurately in the combination chuck and clamp prior to the shaving operation. Coolant is supplied through the hollow spindle of the locator, which has six diagonally drilled holes to direct the coolant against the teeth of the gear.

FEDERAL PRODUCTS CORP., Providence, R. I., has placed on the market two gages of the dial indicator type, one of which is the Model 264P snap gage and the other the Model 1202 B-5 bench type plug gage. The snap gage, which can be furnished for practically any diameter work, has an adjustable lower anvil with a rounded lip for easy insertion of the work. The upper anvil operates under an auxiliary spring tension so as to maintain a constant and uniform pressure at all times on the work. The backstop is adjustable to various work sizes.

The plug gage, which has its indicator calibrated in .00005-in., is designed so that the motion of the contact point is transferred directly to the indicator through a solid continuous unit to prevent error due to bearing fits and friction. The contact point is located underneath the plug, which has two horizontal locating points. Locating contacts, guiding tips and stop collars are available.

DESIGNED especially for supplying direct current to magnetic energy-storage-type spot welders, as used for welding aluminum parts in the aircraft industry, a new ignitron spot-welding rectifier is announced by the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. The new rectifiers are available in two capacities, one for use with 40 kw, the other for 120 kw spot welders. Each rectifier will operate two welders, if they are timed so that only one can be loaded onto the rectifier at a time. The rectifier consists of a control and protective panel, power transformer, and ignitron power tubes, all contained in a forced-ventilated, floor-mounted sheet-metal cabinet with a heavy welded base frame. Tubes are arranged for water cooling.

Other new products of the Westinghouse company are a motor-operated secondary controller for use with polyphase wound rotor motors on fan, pump and similar drives, and an explosion-proof water cooler for Class one, Group D hazardous locations, such as oil refineries and paint factories. The latter is available in three different capacities. Westinghouse also has developed a hot-wire instrument for checking the carburizing atmosphere in hardening furnaces.

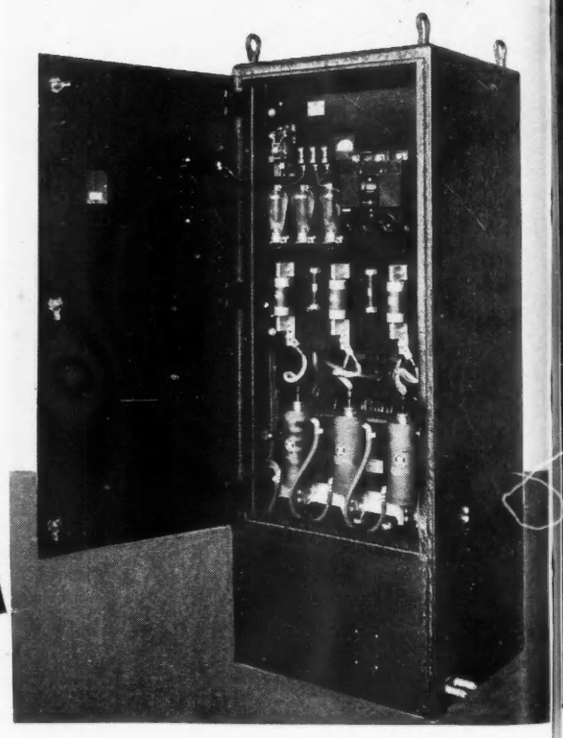
CANVAS enclosures for welding booths have been introduced by the Reliance Electric & Engineering Co., Cleveland, Ohio. Three sides of each booth are made of regular brown welding canvas, hung by the corners from standard safety-zone stanchions, 6 ft. 2 in. in height, with a base weighing 125 lb. Each stanchion has bolted to it a light sheet-steel strip which projects approximately 12 in. on either side of the upright to prevent injurious light rays from passing through the curtain junctions, and to provide a snug enclosure of each booth. The stanchions used at the corners of the booths have two of these light sheet-steel strips bolted at right angles to each other to form tight corners. This method of holding the enclosures in place eliminates wire or pipe supports across the tops of the booths, which would interfere with depositing work from overhead cranes.

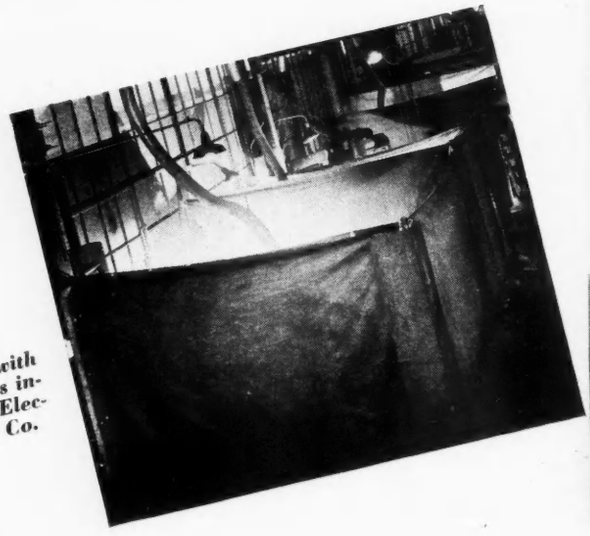
The booths are ventilated by air at a fairly high velocity—545 cu. ft. of air per minute per intake at approximately 4-in. static pressure. A 15-ft. length of flexible tubing, 5 in. in diameter, and individually counterweighted with light airplane cable, is dropped into each booth from an overhead main ventilating line serving all welding stations. Each tube has a screened bell end and is of the right length to be readily maneuverable around and above the work. No tube is long enough to touch the floor or to be laid on it.

Two jib cranes over the line of booths are so placed that they can serve a wide area.

BOTH hands are left free for work with an automatic vise and clamping tool recently placed on the market

Westinghouse ignition for magnetic energy storage type spot welders





Welding booths with forced ventilation as installed by Reliance Electric and Engineering Co.

by the Automatic Vise Sales Co., Los Angeles, Calif. The use of pedals for clamping and releasing the work is a major time-saving feature. A free-sliding, movable jaw can be easily pushed with hand or body against the work, and then clamped and released by means of pedals. The main clamping pedal gives sufficient pressure for general work. If additional pressure is desired, a small auxiliary pedal can be used. By adjusting the small screw on the right hand side of body, the tool can be set for repetitive work.

The foot operated Automatic vise

IN COMPRESSING powdered metals it is often necessary to apply a relatively slow, smooth squeeze to the material, rather than a sharp impact, to allow more time for the metal to flow and thus obtain greater hardness and density in the produced parts. It is especially advantageous in the manufacture of iron gears, bushings, valve seat inserts and other parts to have them as dense as possible when they come from the press. To meet these requirements in applying pressures up to 100 tons, the F. J. Stokes Machine Co., Philadelphia, is offering an automatic, self-contained, cam-operated, toggle-type press.

This No. 280 Stokes Press is fully automatic, has a 2-in. die-fill, produces parts such as iron rings with a maximum of 4-in. diameter and makes 15 to 50 strokes per minute. A hydraulic compensating device cushions the shock of compression, aids in setting-up to the desired pressure, assures the application of the same pressure to and uniform density in each piece.

The Stokes company also recently announced a compressing machine of the rotary type capable of applying 30-tons pressure and producing parts with a maximum diameter of 2½ in. It has a maximum die-fill of 4 in. When the full number of 10 punch and die sets are in use, the output of the machine is 150 pieces per minute in compressing oilless bearings, iron-core magnets, pump seal rings and similar products of powder metallurgy.

Another new Stokes product is a 3-gal. capacity, electrically heated water still in an improved model with complete automatic control. It is stated that this apparatus will produce distilled water of exceptional purity suitable for the most exacting research or other laboratory purposes.

LEWIS-SHEPARD SALES CORPORATION, Watertown, Mass., announces an improved dumping stacker which permits control of the dumping operation by the operator from the floor. This eliminates standing on boxes, improvised platforms, and the like. A self-locking worm makes it possible to hold the drum in any position for any length of time. Control from the floor also permits the operator to reverse the tilt of the drum or barrel to slow down or stop the flow of material from the container.

A LIGHT-WEIGHT, moderately priced power sander for wet or dry sanding and polishing operations has been developed by Union Industries, Inc., Detroit. The "Sand-Air" is said to handle like a blackboard eraser, weighs but 4½ lb., uses factory air pressure from 80 to 150 lb. range without regulation, consuming only 4½ cu. ft of air per min.

This sander is designed to operate with just one hand control, is said to be well balanced and easy to handle. The pad is suspended from the power unit by flexible cushion supports. It is made of a special oil-resisting material, backed up with a chromium plated Swedish steel spring. Special molded pads for fluting or special product forms can be supplied at extra cost. The sander provides 3400, five-eighths inch strokes per minute.

A NEW type Heppenstall automatic Safe-T-Tongs has been designed for one of the large steel mills to lift annealing covers from stacks of steel in coil form. Made of forged nickel-chromium-molybdenum steel, corresponding to S.A.E. 4340, and heat-treated, these tongs eliminate the need for a ground man placing chains or hooks on the extremely hot covers. Since they are fully automatic, all that is required is to lower them on the work, when the tongs will do the job without the aid of a ground man. While these Safe-T-Tongs were first used in steel mills during the past four years types have been developed for lifting paper bales, boxes, pipe, wire and other commodities that are normally handled by means of cranes.

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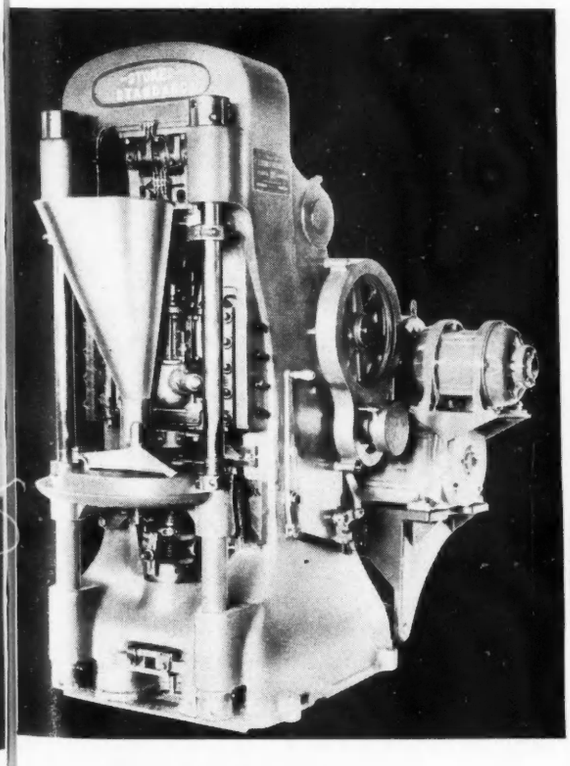


No. 280 Stokes press of 100-ton capacity for powder metallurgy

Union Industries "Sand Air"

Producer Gas is the Motor

ACCORDING to a recent release of the Motor Products Division of the U. S. Department of Commerce, covering automotive-market conditions in Finland, private passenger-car owners in that country were cut off entirely from supplies of liquid motor fuel in the spring of 1940, and truck owners thereafter were given gasoline only if they produced proof that they had installed gas generators on their vehicles or had arranged for such installations.

There resulted a great demand for wood and charcoal generators, which numerous manufacturers in Finland hastened to fill, with the result that by the end of 1940 there were a total of 8500 motor vehicles equipped with generators in the country. The sale and installation of such generators formed, in fact, the main business of automobile dealers during the year. At present a shortage of tires is the chief restriction on the use of motor vehicles in Finland. Importation of tires is hampered by shipping difficulties, lack of foreign exchange, delays in obtaining British navicerts, lack of tonnage, etc. It can be assumed, moreover, that import licenses will be confined to tires for trucks and buses.

The foregoing facts from the release of the Department of Commerce lend timely interest to the following article dealing with the technical problems of gas producers for motor vehicles, from a special contributor in Finland.—Editor.

By HANS A. BRANDERS*

GAS PRODUCED in a gas generator from wood or charcoal consists mainly of carbon monoxide, carbon dioxide, hydrogen, nitrogen and hydro-carbons. In the fire zone of the producer the carbon in the fuel, by combining with the oxygen of the air, forms carbon dioxide, and a great deal of heat is released. Temperatures developed in the process range between 2200 and 2550 deg. Fahr. In the reduction zone, which the gases pass on the way from the fire zone to the outlet, the carbon dioxide passes through a bed of red-hot coal, and carbon monoxide is there formed. Some of the heat energy produced by the combustion in the fire zone is absorbed in the formation of carbon monoxide. Not all of the carbon dioxide is reduced to carbon monoxide. There is a certain condition of equilibrium between the two components, which depends on the temperature and pressure prevailing in the reduction zone, on the depth of the fuel bed forming the reduction zone, and on the velocity of the gas. At 2000 deg. Fahr. the proportion is 99 per cent carbon monoxide to 1 per cent carbon dioxide.

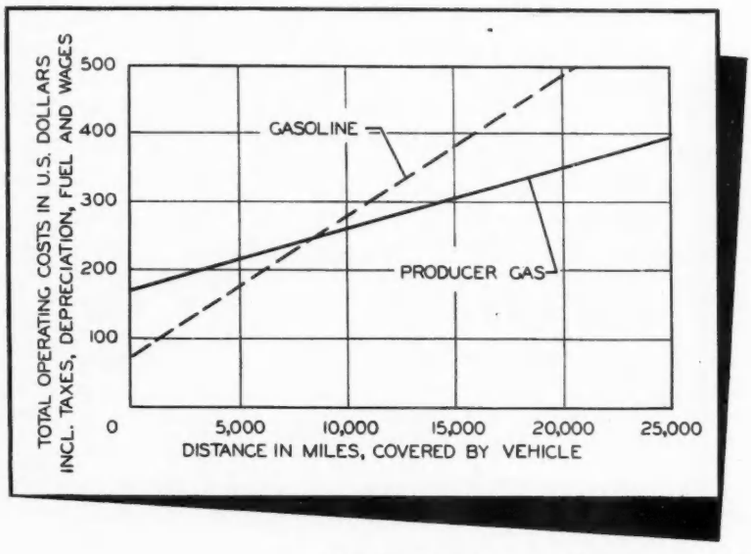


Fig. 1—Operating cost diagram for a 3½ ton truck powered by a 7.1 liter engine

The water contained in the fuel is evaporated and decomposed into hydrogen and oxygen, when it passes the layers of red-hot coal in the reduction zone. The oxygen forms carbon monoxide or carbon dioxide with the carbon, depending on the temperature in the reduction zone. Hydrogen remains in the uncombined state. Evaporation of the water and decomposition of the water vapor into hydrogen and oxygen absorbs heat, this heat being supplied by the combustion of carbon in the fire zone. If the fuel contains an excessive amount of moisture, too large a proportion of the heat of combustion is required to vaporize and decompose the water, and the temperature remains too low to produce an adequate proportion of carbon monoxide. Sometimes too much moisture is held in

* Warkaus, Finland.

Fuel of Finland

suspension by the gas, and the fabric in the cloth filters will become clogged.

Gas of good quality produced from charcoal has the following approximate composition:

Carbon monoxide	CO	30 per cent
Carbon dioxide	CO_2	2 per cent
Hydrogen	H_2	10 per cent
Hydrocarbons	C_nH_m	0—2 per cent
Nitrogen	N_2	56—58 per cent

When wood is used as fuel, the composition of the gas will average as follows:

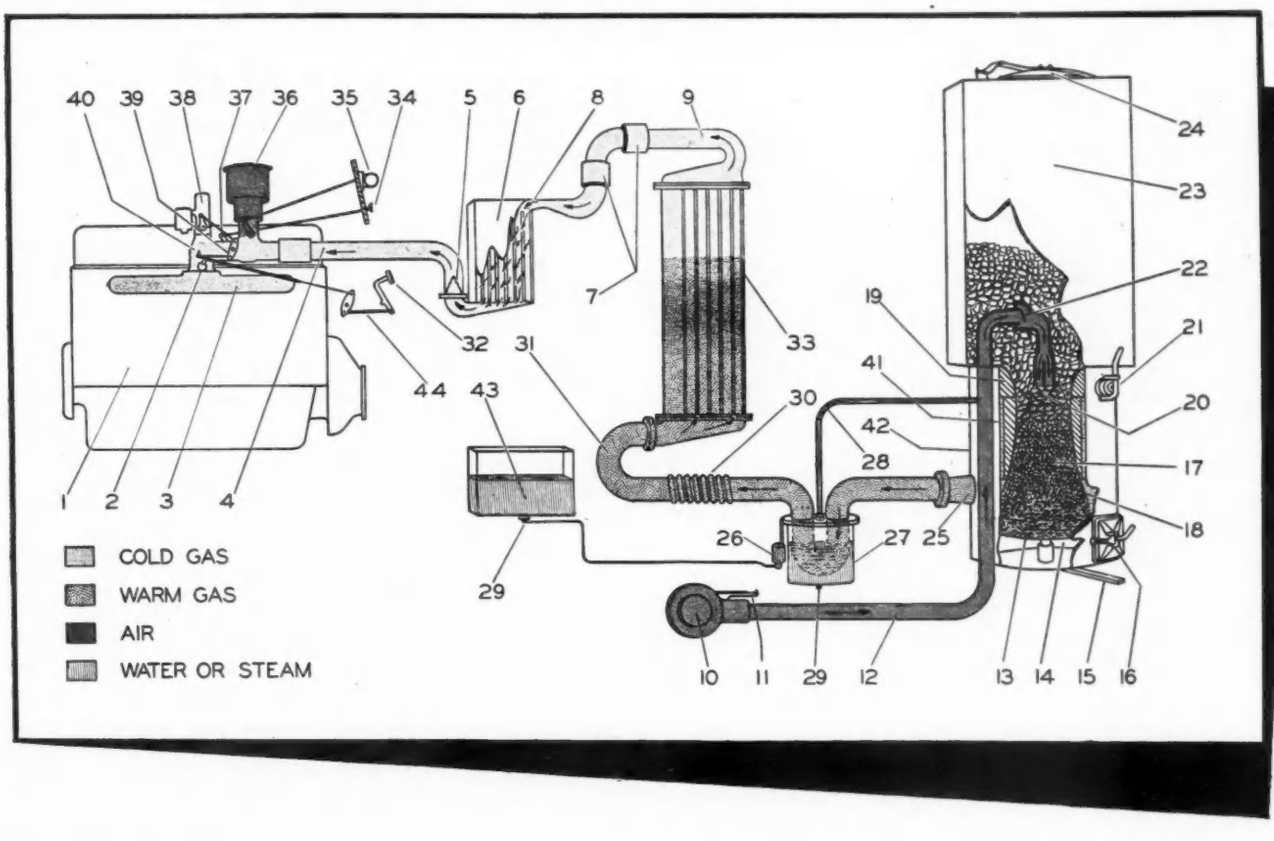
Carbon monoxide	CO	20 per cent
Carbon dioxide	CO_2	11 per cent
Hydrogen	H_2	17 per cent
Hydrocarbons	C_nH_m	2 per cent
Nitrogen	N_2	50 per cent

Gases of the compositions given above make an excellent fuel for internal-combustion engines.

Gas produced from wood contains some turpentine, tar, and acetic acid, and these impurities may have a disastrous effect on the materials used in the system, if the quantities are large enough. The percentages of these impurities or by-products depend upon the temperature prevailing in the gas producer. The tem-

Fig. 2—The Swedish Svedlund gas producing system for charcoal

1. Engine
2. Main throttle
3. Intake manifold
4. Gas pipe
5. Safety strainer
6. Gas cleaner
7. Rubber hose
8. Cleaner pockets
9. Gas pipe
10. Starting fan
11. Fan valve
12. Air pipe
13. Grate
14. Ash bin
15. Grate rocker
16. Ash door
17. Reduction zone
18. Gas-collecting zone
19. Brick lining
20. Fire zone
21. Inspection door
22. Check valve
23. Fuel chamber
24. Filling cover
25. Gas outlet
26. Water float
27. Boiler
28. Steam pipe
29. Drain cock
30. Expansion pipe
31. Gas pipe
32. Accelerator pedal
33. Gas cooler
34. Change-over valve
35. Mixture-control valve
36. Air cleaner
37. Control lever
38. Carburetor
39. Control lever
40. Intake pipe
41. Insulating material
42. Gas producer
43. Water tank
44. Pedal linkage



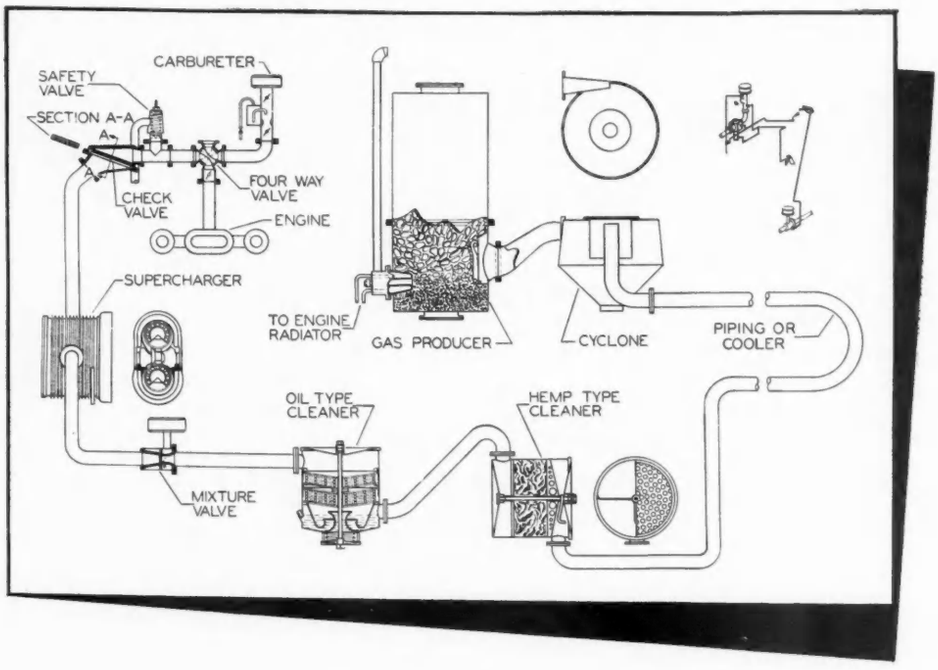


Fig. 3—The Finnish Sysi gas producing system for charcoal In the drawing the part labeled "cyclone" is better known as a centrifugal cleaner.

perature in turn varies considerably during operation, and is in some degree dependent on the skill of the operator. The higher the temperature, the smaller the proportion of these by-products, and the less harmful they are.

Charcoal does not contain these impurities, as they are eliminated in the charring or charcoal-burning process. The best charcoal is obtained from wood of foliferous trees, but wood of coniferous trees also gives fairly good coals. Charring in ovens at about 1200 deg. Fahr. gives better coals than charring in kilns, where the temperature normally is about 1500 deg. Fahr. The percentage of water in charcoal can be 10 to 15, but not higher, and the dimensions of the pieces of coal are preferably limited to about 2 in. When using wood as fuel, the percentage of water must not exceed 30, which is a rather high value. Wood is fed to the producer in pieces of the same limiting dimensions as given for charcoal.

Roughly, one gallon of gasoline corresponds to 12.5 lb. of charcoal and 20 lb. of wood.

When using producer gas as fuel in a gasoline engine, a 40 per cent loss in engine power must be figured with. This loss, however can be pared down in several ways, as will be described later.

When comparing costs of operation on gasoline and producer gas, respectively, the following facts must be taken into consideration: The first cost of gas-generator equipment is higher than that of the corresponding gasoline equipment; consequently, interest and depreciation are higher for the former. The cost of maintenance also is higher for the generator, because of the higher repair costs and increased driver's wages, due to the care and cleaning required by the gas-generating system. Taxes usually are lower on vehicles with gas generator. Fuel costs are lower with producer gas. A typical cost diagram for a 3.5-ton truck equipped with a six-cylinder, 433-cu. in. engine is shown in Fig. 1.

When a gas generator is to be installed in an existing vehicle, due consideration must be given to the size of the vehicle. The total weight of the various equipments now being manufactured for the market varies between 300 and 800 lb. The loss in pay-load capacity due to such an installation is, of course, relatively greater in light than in heavy vehicles. For trucks operating under normal conditions, the practical minimum load capacity warranting the installation of a gas generator is about 3 tons.

The success of a conversion of an old truck to the use of producer gas will depend to a considerable extent on the design of the engine carried. Desirable engine features include the following:

1. Rugged design, with liberally dimensioned bearings and parts, to withstand the increased loads that result from an increase in the compression ratio.
2. A comparatively low rotative speed.
3. A large piston displacement relative to the size of the vehicle.
4. Intake ports and intake manifold of ample size.
5. The possibility of increasing the compression ratio at moderate expense.
6. A wide range of spark timing, preferably under hand control.

A complete producer-gas outfit consists of the gas producer, the cooler, the coarse cleaner, the fine cleaner, the mixture valve, the starting fan, the necessary piping and valves, and manifolding to make possible running on either gas or liquid fuel. If a supercharger is installed there is need also for a safety valve and a check valve. Typical automotive gas-generating equipments are the Swedish Svedlund, Fig. 2, and the Finnish Sysi, Fig. 3.

The gas producer proper is generally designed in the form of an upright cylindrical container. Its upper part serves as a fuel chamber, and it is provided with a filling opening at the top, which is closed by a suitable lid. The fuel chamber often is made rectangular in cross section, in order to use the available space to best advantage. Gas is generated in the lower part of the producer. The air intake is usually provided with a flame arrester, to protect the operator against possible backfires.

There are three fundamentally different arrangements of the gas producer, as regards the locations of the air intake and gas outlet and the direction of

flow through the device, and these are illustrated diagrammatically by Figs. 4a, 4b, and 4c.

In an updraft gas producer, Fig. 4a, the air intake is located near the bottom, and the air either flows through the grate at the bottom or enters at the fire zone just above the grate. This type of producer is used only with fuel containing no tar, and is unsuitable for wood. With this system it is impossible to add fuel while the generator is in operation, unless double filling shutters are fitted, without which an excessive amount of air would enter the system through the filling opening and seriously disturb the generating process.

In the downdraft type of gas producer, Fig. 4b, the air flows through in the opposite direction from that just described. Tarry fuels of all kinds can be burned in producers of this type.

The third type of gas producer is the cross-draft type, Fig. 4c, in which the air passes from the air nozzle, located at one side of the producer, to the vertical grate located on the opposite side. From the far side of the grate the gas passes on to the engine. This system, the simplest of the three, also is adapted to the use of tarry fuels. With the two last-mentioned systems, fuel may be added through an opening in the top of the producer without seriously disturbing the gas-generating process.

The air jets or nozzles are either water-cooled or made of a heat-resisting Cr-Ni-Al-Fe casting alloy. In some producers the wall of the fire zone is made of heat-resisting steel, or else it is lined with fire brick or cement.

The cooler usually is built up of thin-walled tubes of circular, oval or other suitable cross section. Some installations have no separate cooler, the gas being cooled in the coarse cleaner or in the gas pipe, which in that case is made somewhat longer than would be necessary otherwise.

Gas leaves the producer at a temperature of 750-950 deg. Fahr. If a fabric-type cleaner is used to remove the fine dust, the temperature of the gas upon entering this cleaner must be not less than 200 deg. Fahr., so that the gas will contain no water vapor which might clog the fabric. As the mixture of air and gas reaches the engine, its temperature is usually somewhere between 100 and 140 deg. Fahr.

In some installations the gas, after leaving the producer, is first cleaned in the coarse cleaner, which is located in the gas line either ahead of or beyond the cooler. This cleaner is usually of the centrifugal type. In wood-burning systems the coarse cleaner and cooler are often combined in a system of inertia cleaners consisting of a group of large-diameter tubes provided with perforated partitions. At these partitions the gas is forced to change its course abruptly, and the larger solid particles, which cannot change their directions so readily, are separated out and deposited in the tubes between partitions. Sometimes some of the tubes are partly filled with water, through which the gas is forced to bubble.

The fine cleaner may consist of a box filled with thorn hemp or similar material, or of a box or container within which there are cells or pockets formed by frames covered with fabric and so arranged that when the gas is drawn into these pockets, all impurities still carried by it are deposited on the outside of the fabric. With the former type of cleaner the hemp cleaning element is periodically—sometimes daily—taken from the container and shaken or cleaned by the operator. With the fabric-cell type of cleaner, the ash, soot, and impurities collecting on the fabric can be removed therefrom with the help of a brush. These cleaner elements must be cleaned frequently, in order that the resistance to gas flow through them may be kept low. Other types of fine cleaner include one which is half-filled with oil and in which there are metal rings, ferrules or shells in the upper half. When the gas bubbles through the oil it deposits its impurities. The ferrules in the cleaner must be cleaned by washing them from time to time with compressed air or gasoline, or by changing the oil.

For starting the generator (when there is no suction from the engine), use is made of a 150- to 200-watt electric fan to supply the air needed. The fan

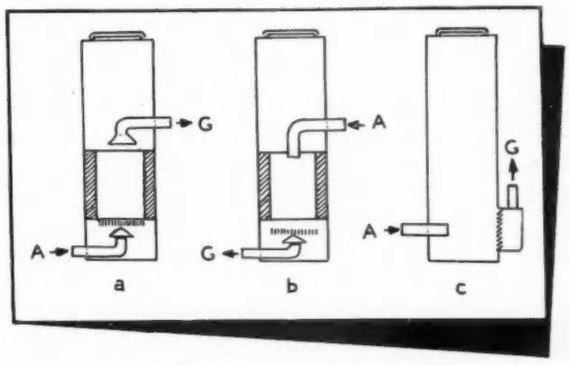


Fig. 4—Types of gas producers
a. Updraft type of gas producer
b. Downdraft type of gas producer
c. Crossdraft type of gas producer
A—Air inlet G—Gas outlet

or blower is placed either in the air-intake line, when it operates by pressure, or more often and more advantageously, between cleaner and engine, when it operates by suction. It takes from 5 to 15 min. before gas of the proper quality to run the engine on is available. An additional storage battery is often installed to supply the considerable amount of electric energy required for starting the generator.

Gas-air mixing valves are of various designs and usually hand-controlled. The usual gas/air mixture ratio is about 1/1. The whole system, including the piping, must be made absolutely air-tight, to prevent undesired air leakage and to ensure undisturbed operation.

In the Swedish Svedlund system the efficiency of the producer process and the heat value of the gas are increased by adding steam to the producer intake air, thereby increasing the hydrogen content of the gas. The amount of steam which can be advantageously added varies with the temperature of the atmosphere, and, therefore, changes with the seasons.

***The concluding part of this article on gas producers will appear in an early issue of* AUTOMOTIVE INDUSTRIES.**

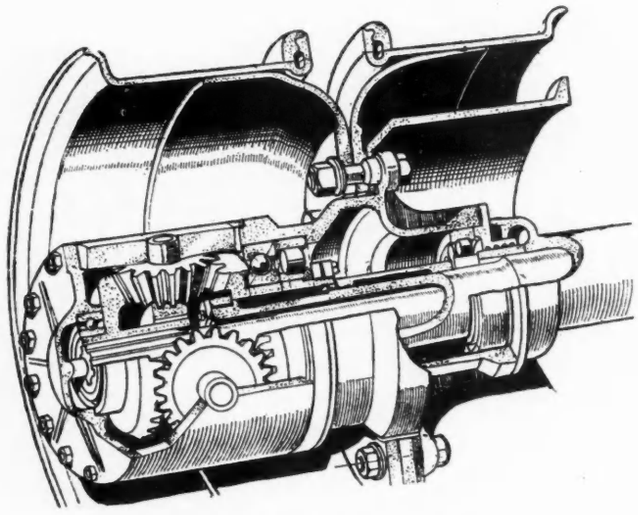
Foden Six-Wheeled Tractor Has

Planetary Reduction Gear in the Hubs

By M. W. BOURDON

FOR urgent work in a British colony there has been developed a new model of the British Foden truck-tractor which, in its driving mechanism embodies a 2 to 1 planetary reduction gear in all rear hubs. As a result, on low gear, an overall ratio of 160 to 1 is secured and a maximum torque of 26,400 ft.-lb. at the road wheels is obtained.

The chassis has a wheel base of 149 in. and is designed for use with a 2-wheel semi-trailer. It is being employed currently in combination with an articulated tipping wagon which has a pay load capacity of 30 long tons. The tractor is built on a 6-wheel chassis with 4-wheel drive through overhead worm gears to the two axles of the rear bogie. A five-speed transmission is provided.



Hub reduction gear of new Foden tractor (from Commercial Motor, London)

It is claimed for the hub reduction gear that it permits the use of relatively small worm wheels in the axle centers in combination with worms of large diameter, and that it relieves the differential and axle shafts of excessive loading, maximum torque being applied directly and only to the wheel hubs.

The dimensions of the hub reduction gear are such as to permit the standard disk wheels to be used, mounted on the usual driving studs. As shown in the accompanying perspective section (from *Commercial Motor*, London) the end of the axle casing carries a stationary bevel gear, forming the sun gear. Within the hub, where this extends beyond the axle casing, is a four-arm star piece carrying the four planet wheels; the drive shaft extends through and beyond the star piece and at its extreme end has splined to it a bevel forming the third element of the reduction gear.

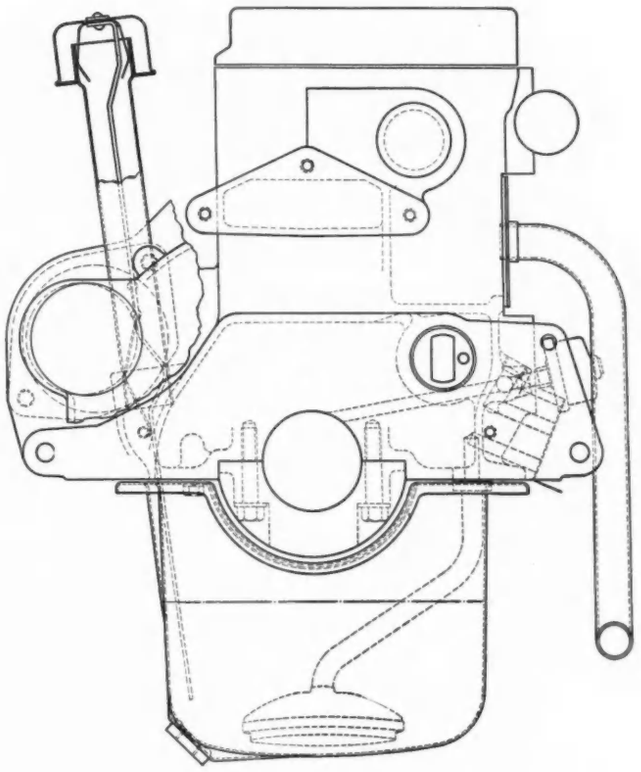
One ball and two parallel roller bearings support the hub. The innermost roller bearing is mounted on the axle casing, while the outer one and the ball bearing encircle a short hollow extension of the stationary (sun) bevel. Centralizing the outer end of the drive shaft and the outer bevel of the assembly is another ball bearing, with its outer race housed in the detachable end cover of the hub, which also locates the drive shaft axially.

A standard type of six-cylinder Gardner Diesel engine developing 100 b.hp. is used. The brakes are of the Bendix Cowdrey type with Lockheed hydraulic operation and Dewandre vacuum servos. Suspension of the rear bogie is by two reverse-camber half-elliptic springs with their ends attached to the axles and the latter located by radius members; the spring centers are trunnion-mounted on the chassis. Tires are 36 by 8 in., duals on all rear wheels. No differential is provided between front and rear driving axles.

A New ASA Publication

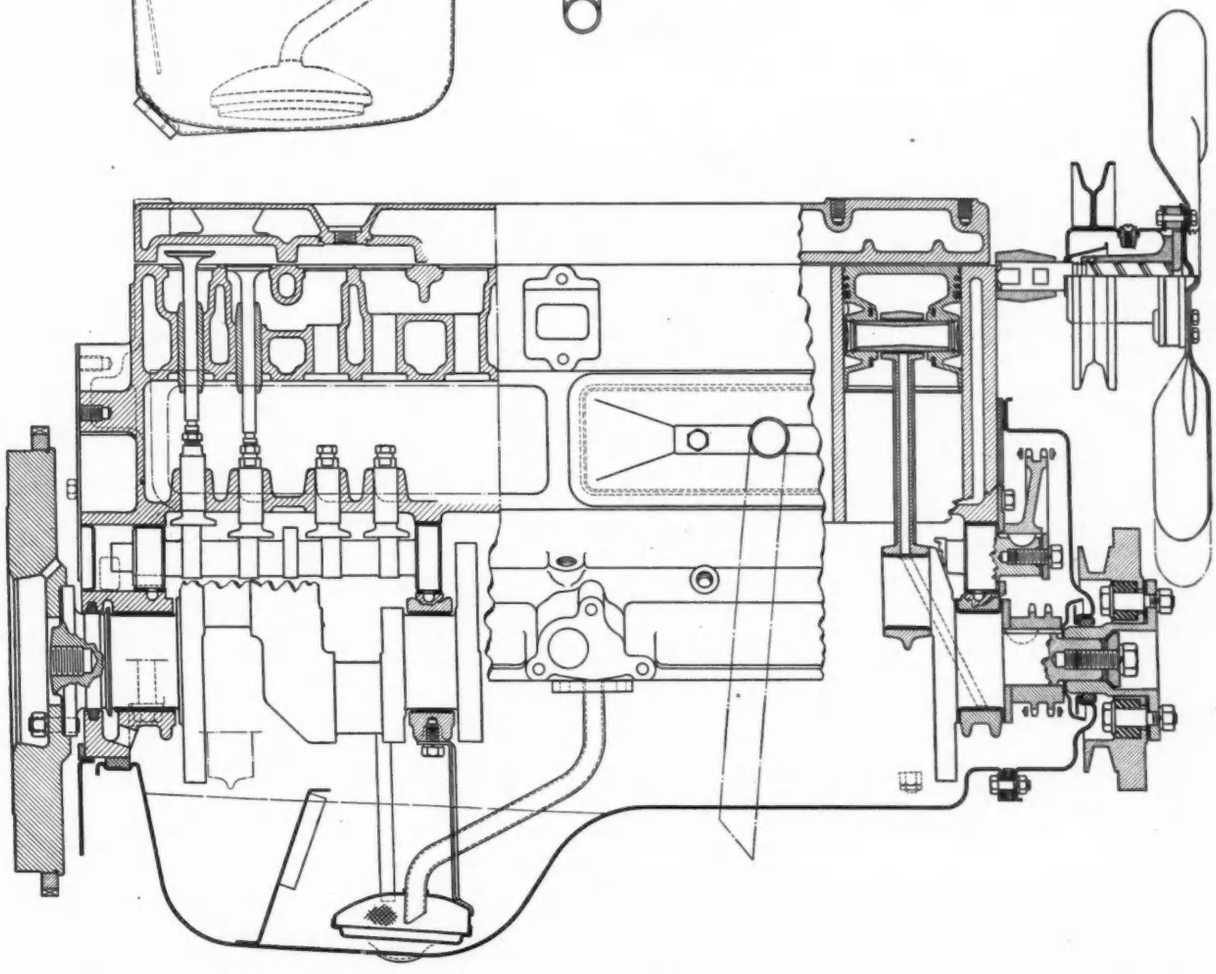
A pamphlet entitled "Tolerances for Cylindrical Fits," by John Gaillard, mechanical engineer on the staff of the American Standards Association, has just been published by the latter organization and is available from its headquarters, 29 West 39th Street, New York, at 25 cents a copy.

NASH AMBASSADOR 600 ENGINE



THIS engine, which powers the low-priced Nash 1941 passenger-car model, is a six-cylinder L-head design with a bore of 3⅛ and a stroke of 3¾ in. This makes the piston displacement 172.6 cu. in. The compression ratio is 6.70 and the rating of the engine is 75 hp. at 3600 r.p.m., corresponding to a b.m.e.p. of 95.5 lb. per sq. in The maximum torque is 136 lb-ft at 1200 r.p.m., which corresponds to a b.m.e.p. of 118 lb. per sq. in.

The views shown on this page are a front elevation and a side elevation partly in section, while on the following page are shown a section through the center line of one cylinder and a plan view with one-half of the cylinder head cut away. Cylinders and crankcase are cast in a single block, with "full-length" water jackets.

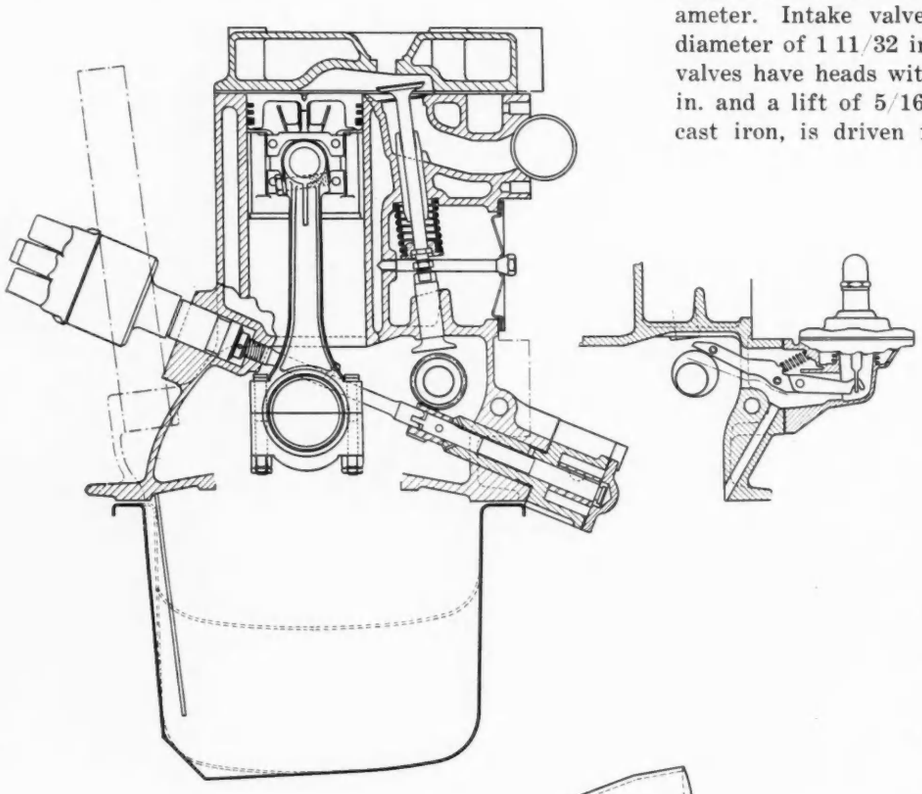


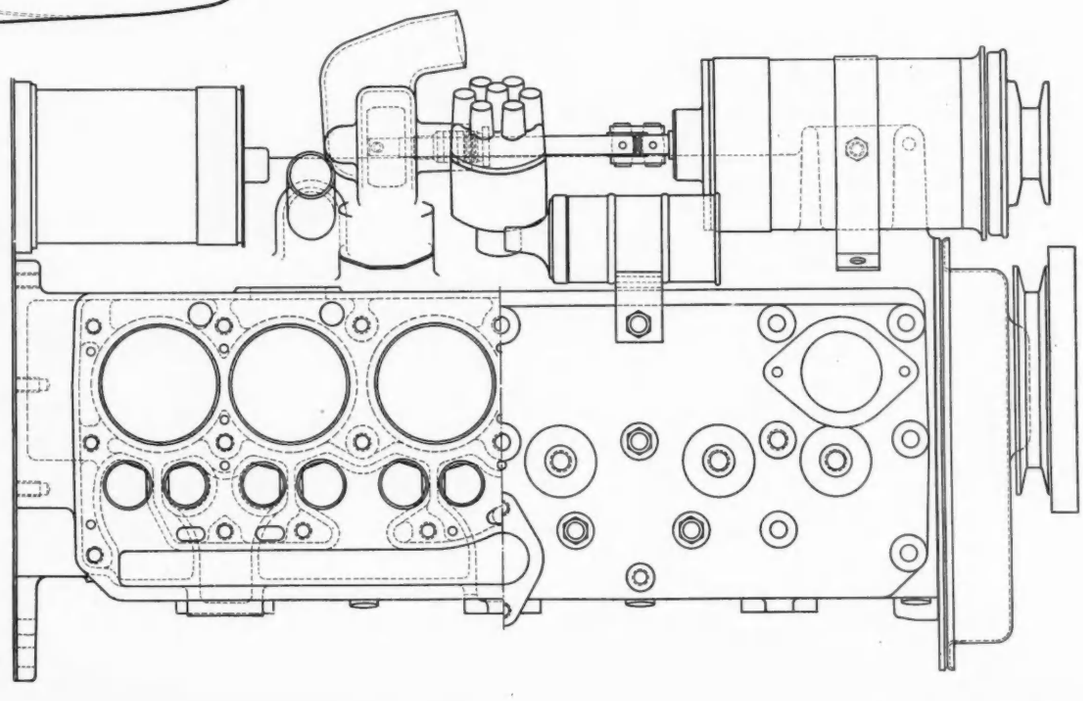
NASH AMBASSADOR 600 ENGINE

The valves are strongly inclined, in order to reduce the volume of the valve pockets, which is made necessary by the high compression ratio.

Pistons are of aluminum alloy and carry two compression rings and one oil ring each. Connecting rods measure 6¾ in. between centers. The crankshaft is supported in four main bearings, all of 2 31/64-in. diameter. Intake valves have heads with an outside diameter of 1 11/32 in. and a lift of 5/16 in; exhaust valves have heads with an outside diameter of 1 9/32 in. and a lift of 5/16 in. The camshaft, which is of cast iron, is driven from the crankshaft through a two-strand roller chain.

An interesting feature of the engine is that it has no manifolds of the usual type. Intake passages are cast in the block, extending from end to end, with an inlet from the downdraft carburetor at the center. The exhaust pipe is clamped against the side of the cylinder block and communicates with the three exhaust ports.





NEWS OF THE INDUSTRY

Navy Anti-Aircraft Guns to Be Built by Chrysler

40-mm. Rapid-firing Weapons Will Be Mounted on Ships for Defense Against Dive Bombers; More Orders Placed

Chrysler Corp. has reached an agreement with the U. S. Navy for the manufacture of 40-mm. rapid-firing anti-aircraft guns, which are mounted on ships as a defense against dive bombers. Orders for more than $2 000,000 worth of machinery have been placed and production is expected to get under way early next year at a rate of 300 guns monthly. This gun, understood to be an adaptation of the Swedish Bofors weapon, can fire 120 explosive shells per minute.

Frank J. Morisette, general staff master mechanic for Chrysler Corp., has been appointed operating manager of the Chrysler Gun Arsenal. Final assembly of the guns will take place in the Lynch Road plant, once used for manufacturing Dodge trucks and recently set up for the manufacture of shells and fuses. Additional manufacturing operations will be concentrated at the Chrysler-Jefferson and DeSoto plants, while parts will be made at Highland Park, Dodge Main and Plymouth, all at Detroit; New Castle, Ind., and the Airtemp Division at Dayton, Ohio.

Willys Makes 155-mm. Cannon

Willys-Overland Motors, Inc., started delivery at the end of April from its Toledo plant of the first of 900,000 shell forgings for 155-mm. guns on a $9,000,000 Government order. The company also is making steel forgings for British tank tracks and aluminum forgings for aircraft parts. Willys also is making powder hoists for U. S. Navy 6-inch guns at the rate of seven per month over the next three years. These hoists contains 3200 parts and cost $20,000 apiece. Gun breeches and recoil cylinders also are being delivered. Vernon Drun is in charge of Willys' ordnance production.

Volume production on the Willys ¼-ton command reconnaissance trucks for the U. S. Army is due to begin May 5. The order for $1,425,000 include 1500 vehicles. The Willys version of the "blitz buggy" weigh 2265 pounds compared to 2100 pounds for the Ford type. It is powered by a 4-cylinder 70 hp. engine compared to the 45-hp. Ford job. American Bantam Car Co. also has an order for 1500 of these trucks.

Construction work on the Buick aviation engine plant at Melrose Park, Ill., is progressing slightly ahead of schedule. Contracts totaling more than $4 000,000 for the main manufacturing building, which will contain over 1 000,000 sq. ft., the test houses, power house and personnel building already have

(*Turn to page* 499, *please*)

"Priorities and Defense"

A handbook on the operation of the priorities system has been made available for general distribution by the Division of Information, Office for Emergency Management, new Social Security Building, Washington, D. C.

Called "Priorities and Defense," the booklet includes a general statement on the theory and administration of the priorities system, a question and answer section, a copy of the Priorities Critical List, instructions on priorities for the Army and Navy, and reproductions of preference rating forms.

Army 28-Ton Blitz Fortresses Make Debut

"Pilot models" of Uncle Sam's 28-ton tanks, the forerunner of a huge fleet soon to roll from the production lines of three large tank arsenals, were delivered the latter part of April at Detroit, Philadelphia and Schenectady. Earlier in the month an experimental model, built at the Rock Island Arsenal by the Government, was tested at the Aberdeen, Md., proving ground of the Army before a group of high Army officers, OPM officials and British representatives.

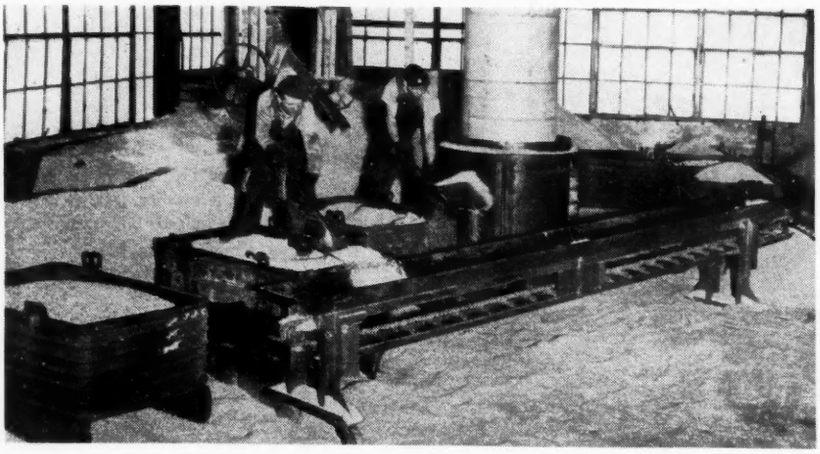
Contracts for building hundreds of these tanks, designated the M-3, have been awarded to the Chrysler Corp., Baldwin Locomotive Co. and the American Locomotive Co. "Pilot models" were built preliminary to completion of tooling the arsenals for mass production. Chrysler delivered its two pilot tanks on April 24, when during exercises at the Chrysler tank proving ground, an impressive performance was given in an extensive series of maneuvers and with guns in action. One of the two tanks was purchased by Chrysler dealers and distributors to be presented as a gift to the Army.

Though classified as a medium-sized tank, the M-3 weighs 28 tons, has an over-all length of 18 ft. and its height is more than 8 ft. The transmission weighs 7600 lb., more than two heavy automobiles, and requires 1000 man-hours of productive labor in its manufacture, more than it takes to assemble an entire automobile.

Its armament is formidable, including a 75 mm. gun with a firing range of 15,000 yards, a 37 mm. anti-aircraft gun mounted in a power driven turret, and four machine guns, two of .30 caliber at the top and the two lower down are .50 caliber. The crew of seven has submachine guns available for firing through the port holes in short range combat.

The heavily armored M-3 tank is powered by a 400-hp. Wright airplane engine of the radial, aircooled type. The rated speed is 25 m.p.h., but it is said there is enough power in reserve to reach 50 m.p.h.

The crew is protected from face injuries and body bumps by a lining of air-cell sponge rubber, which is used on gun turrets, hatches, recoil guards on guns, commander's turret, ammunition clips and other hazardous points. This protective lining is most beneficial when plowing through stone walls or careening over embankments. Crash helmets are provided for the crew.



Nothing Wasted!

That is the rule at Buick plants, where last year salvaged materials totaled over 244,000,000 lb., mostly metals. Even exhaust steam from the power lines is used and reused, then to be returned to the power house to be reclaimed as water. Buick workmen are shown loading aluminum borings for shipment to smelters. Over 545,000 lb. of scrap aluminum were saved last year

Auto Cut Not Likely to Affect Metal Prices

Curtailment Intended Primarily to Divert More Materials to National Defense Needs; Warn Against Cadmium Price Rise

By W. C. Hirsch

In the light of latest developments, automotive consumers have come to the conclusion that the steel market's basic structure will remain unchanged for the time being in spite of the 10-cent per hour wage increase granted to their employes by producers. The suggestion of a prominent steel company executive that the current quarter be made a fact-finding period, in which to ascertain actual costs, has evoked much interest. The defense program has brought into large scale use a number of descriptions of steel, such as alloy plates rolled on continuous mills, for which dependable cost data remain to be ascertained.

As consumption of a certain class of steel goes up, production costs come down, and it is believed that in a number of instances findings of higher or lower costs before long will bring minor price changes. Impending reduction in the output of automobiles and motor trucks by a million units is not expected to have any effect pricewise on steel or non-ferrous metals, serving merely as an emergency measure for diverting to urgent national defense needs the material saved by cutting down the output of 1942 model passenger cars and trucks. The automobile industry, in spite of this temporary cut in consumption of iron, steel and non-ferrous metals, will still lead in point of consumption of these commodities, provided, of course, that corresponding reductions are promulgated in other non-defense industries.

Some blast furnaces have had to suspend operations as the result of running out of coke, the shortage being the result of the coal miners' strike. This tends to lengthen further the time which steel mills name for shipment of orders. Some Middle West producers are accepting sheet orders for delivery in the first quarter of next year at prices then prevailing, although one prominent independent announced a few weeks ago that no 1942 business would be booked at this time. Fall deliveries on carbon steel bars are the best that some sellers will promise. The rate of ingot production, according to the American Iron & Steel Institute, dipped in the last full week of April from 99.8 to 96 per cent of capacity, the recession being attributed to lessened pig iron receipts, which in turn resulted from the tight coke situation.

Copper Price a Quandary

Connecticut brass mills are asking for more copper than the Metals Reserve Co. has available for distribution from its Latin-American purchases. Leading domestic custom smelters have expressed doubt that a higher price for copper would bring a marked increase in mine production. To stimulate activity in high cost producing areas, the price would have to be increased to as high as 18 cents a pound which would undermine what has been accomplished to hold the price, now 12 cents a pound, at a reasonable level.

(*Turn to page* 498, *please*)

High Preference Rating for Piston Aluminum

Under an index classification issued by the OPM Priorities Division, covering priority ratings for most civilian uses of aluminum, automobile and automobile equipment manufacturers are given preference on aluminum to be used in engines and pistons over aluminum used by them for all other purposes. The lowest rating assigned—B8—was made applicable to "all other uses," while internal combustion engines and pistons were given a B4 preference rating. The classification will be used as the basis of aluminum shipments beginning in May.

The OPM has announced that the zinc pool from which the Priorities Division may make mandatory allocations to meet urgent defense needs is to be raised from five per cent to 17 per cent of production for May. For April, producers of slab zinc were required to set aside an amount of the metal equal to five per cent of the January production. For May, the 17 per cent pool will be based on March production. It said that it should amount to approximately 12,000 tons.

Machine Tool Shipments

Machine tool shipments for March are estimated at $57,400,000 as compared to $54,000,000 for February and $29,000,000 for March, 1940.

CALENDAR

Conventions and Meetings

American Gear Mfg. Assoc., Hot Springs, W. Va. .....May 5-7
National Metal Trades Assoc., Chicago, May 8-9
American Foundrymen's Assoc., New York .....May 12-15
Western Metal Exposition and Congress, Los Angeles .....May 19-23
Aluminum Assoc. (Summer Mtg.) Cincinnati .....May 20
American Iron & Steel Institute, New York .....May 22
American Battery Manufacturers Assoc., Detroit .....May 22-23
Automotive Engine Rebuilders Assoc., Pittsburgh .....May 22-24
Society of Automotive Engineers, Summer Meeting, White Sulphur Springs, W. Va. .....June 1-6
Eastern Photoelasticity Conference, Cambridge, Mass. .....June 12-14
American Society for Testing Materials, Annual Meeting, Chicago....June 23-27
Natl. Petroleum Assoc., Atlantic City, Sept. 17-19
Society of Automotive Engineers, National Tractor Meeting, Milwaukee, Sept. 25-26
Natl. Lubricating Grease Inst., Chicago, Sept. 29-30
Natl. Safety Council, Chicago....Oct. 6-10
American Welding Society, Philadelphia, Oct. 19-24
American Society for Metals, Philadelphia .....Oct. 20-24
Society of Automotive Engineers, Aircraft Production Meeting, Los Angeles .....Oct. 30-Nov. 1

Shows

Automobile Accessories Association Show, Chicago .....Aug. 4-7

American Truck Exports to British Empire Jump

The British Empire, according to the U. S. Department of Commerce, absorbed 59 per cent of the total U. S. exports of new trucks during February as against 15 per cent for the same period last year, an increase of 292 per cent. Out of the total of 10,179 trucks exported with a value of $8,879,972, the British Empire took 6031 valued at $5,854,054. During February 1940, only 1538 trucks were shipped to the various parts of the Empire from a total of 10,286 to all countries.

For the first two months of 1941, there were assigned to the British Empire 11,247 American made trucks, or approximately 60 per cent of the 18,829 total exported during that period. This is a gain of about 214 per cent over the 3577 assigned to the British Domains out of the 19,824 truck exports to all countries during the first two months of 1940. Data pertaining to new truck exports to the many separate divisions of the British Empire are for the first time not made available, but instead, shipments to all parts of the Empire are grouped together.

Diesel engine powered trucks accounted for 99 per cent of all trucks shipped in the tonnage classification of over 2½ tons during the first two months of 1941. They numbered 2947 while gasoline engine propelled trucks in this same tonnage classification were only 27 in number. The British Empire took 2816 Diesel powered trucks or approximately 95 per cent of their total. Other truck exports to all countries according to tonnage, in this same period were 1240 under 1 ton; 12,504 1 to 1½ tons; 2090 over 1½ tons but not over 2½ tons; and 21 buses.

40 YEARS AGO

After experimenting for two years on the value of automobiles for conveying stores and ammunition, the Austrian military authorities now intend to test the possibilities of transporting troops by this method. Special automobiles are being constructed by an Austrian firm. The vehicles, it is claimed, will be capable of traveling over uneven ground safely and ramming fences or other obstacles to a cross country journey.

* * *

The French military authorities make an annual conscription of horses throughout the republic, and it appears from a circular just sent out from the artillery headquarters at Vincennes that automobiles are now to be subjected to a similar conscription. The circular calls for an immediate return of full particulars concerning automobiles and motorcycles, with a view to purchase in case of a mobilization of the army.

From the *Horseless Age*, April, 1901.

Business in Brief

***Written by the Guaranty Trust Co., New York, Exclusively for* AUTOMOTIVE INDUSTRIES**

Recession of business activity from the peak recorded in the fourth week of March is partly attributable to the strike of coal miners. The seasonally adjusted index of The New York *Times* for the week ended April 12 fell to 120.6 per cent of the estimated normal from 121.7 for the preceding week, as against 98.3 a year ago. The unadjusted index of *The Journal of Commerce* for the same period was 109.0 per cent of the 1927-29 average, as compared with 113.2 for the week before.

Department store sales during the week ended April 12, according to the Federal Reserve compilation, exceeded by 40 per cent the total for the corresponding week last year, the comparison being affected by the lateness of Easter this year. The total for 1941 to that date is 13 per cent greater than comparable 1940 sales.

Bank debits to deposit accounts, except inter-bank accounts, in leading cities during the 13-week period ended April 16 were 15 per cent above the total a year earlier.

The movement of railway freight during the week ended April 12 noticeably reflected the drop in coal output. Loadings totaled 679,808 cars, 0.5 per cent fewer than in the week before, but 9.8 per cent more than the comparable number last year.

Electric power production during the same period declined more than seasonally to a level 12.5 per cent above that a year ago, as against a similar gain of 16.7 per cent for the preceding week.

Business failures during the week ended April 17 rose to a total of 267 from 240 for the week before, according to the Dun & Bradstreet report, as compared with 262 a year ago.

Crude oil production in the week ended April 19 averaged 3,752,650 barrels daily, 149,000 barrels above the average for the preceding week and 43,350 barrels more than the currently required output as computed by the Bureau of Mines.

Average daily output of bituminous coal during the week ended April 12 was only 208,000 tons, as compared with 660,000 tons a week earlier and 1,283,000 tons a year ago.

Cotton mill activity advanced contraseasonally in the same period; The New York *Times* adjusted index rose to 164.3 per cent of the estimated normal from 161.2 for the preceding week, as against 112.2 a year ago.

Member bank reserve balances increased $323,000,000 in the week ended April 16, and estimated excess reserves rose $230,000,000 to a total of $6,260,000,000. Business loans of the reporting members increased $36,000,000, to stand $1,100,000,000 above the comparable amount last year.

Exports and Imports of the Automotive Industry

	FEBRUARY 1940		FEBRUARY 1941		TWO MONTHS ENDED FEBRUARY 1940		TWO MONTHS ENDED FEBRUARY 1941	
	No.	Value	No.	Value	No.	Value	No.	Value
EXPORTS								
Automobiles, parts and accessories		$ 23,834,998		$ 24,027,541		$ 47,570,892		$ 49,406,379
PASSENGER CARS								
Passenger cars and chassis	9,692	6,135,741	6,386	4,481,963	23,026	13,948,069	13,416	9,357,088
Low price range $850 inclusive	8,350	4,759,088	5,278	3,252,221	20,265	11,129,702	10,812	6,528,126
Medium price range over $850 to $1,200	1,177	1,118,720	908	873,122	2,438	2,312,719	2,132	2,069,594
$1,200 to $2,000	152	221,883	176	266,212	295	429,153	436	639,178
Over $2,000	13	36,050	24	90,408	28	76,495	36	120,188
COMMERCIAL VEHICLES								
Motor trucks, buses and chassis (total)	10,286	8,967,086	10,179	8,879,972	19,824	15,178,104	18,829	17,082,360
Under one ton	1,232	583,247	499	279,570	2,787	1,229,693	1,240	647,927
One and up to 1½ tons	5,524	2,953,583	6,815	3,878,526	12,221	6,449,519	12,504	7,945,281
Over 1½ tons to 2½ tons	2,499	3,410,326	1,190	1,334,454	3,471	4,602,836	2,090	2,483,164
Over 2½ tons	955	1,894,191	1,661	3,369,993	1,266	2,767,382	2,974	5,980,382
Bus chassis	76	125,739	14	17,429	79	128,674	21	25,606
PARTS, ETC.								
Parts except engines and tires		4,009,664		5,753,133		9,142,343		12,694,401
Automobile unit assemblies		3,493,079		3,378,310		6,673,992		7,117,954
Automobile parts for replacement (n.e.s.)		407,807		470,772		756,946		1,019,987
Other automobile accessories (n.e.s.)		313,753		296,465		597,898		538,336
Automobile service appliances								
Airplanes, seaplanes and other aircraft (powered)	170	14,522,442	344	19,267,436	375	30,400,226	802	46,293,748
Parts of airplanes, except engines and tires (n.e.s.)		854,771		2,259,608		3,452,210		4,621,164
INTERNAL COMBUSTION ENGINES Stationary and Portable								
Diesel and semi-Diesel (other than automotive)	54	117,176	92	190,981	125	306,038	145	305,204
Other stationary and portable								
Not over 10 hp.	1,444	83,659	1,375	80,298	2,633	151,466	2,531	162,451
Over 10 hp.	168	162,595	129	278,971	467	33,312	248	419,667
Engines for:								
Motor trucks and buses	1,990	187,610	2,473	388,151	4,442	479,372	5,069	778,580
Passenger cars	2,189	187,588	778	94,896	4,870	410,603	1,988	235,135
Aircraft	285	2,541,415	668	8,271,048	649	5,655,565	1,182	13,981,050
Accessories and parts (carburetors)		417,052		423,348		700,214		805,127
IMPORTS								
Automobiles (dutiable)	38	34,523	22	15,557	94	103,392	45	38,248

Acme

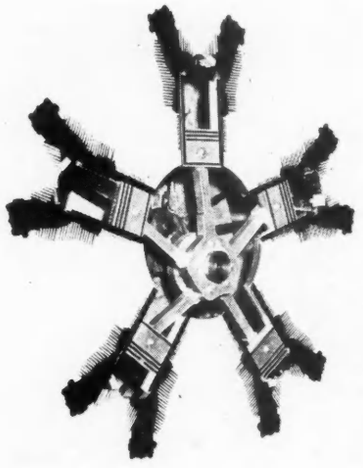
Army Tests "Trackless" Tank

Having possibilities for reconnaissance use, this "trackless" tank underwent tests recently before Army officials at Ft. Myer, Va. It is manufactured by the Trackless Tank Corp. of New York. Secretary of War Stimson witnessed the new war machine in action

Aircraft Engine Model Shows Motion of Parts

Attracting considerable interest is the working model of a radial aircraft gasoline engine that has been built by the Williamsport Museum Extension Project Unit of the Pennsylvania Work Projects Administration. Intended primarily for classroom instruction, orders have been received for similar models to be used in engineering schools and in connection with the National Defense educational training program.

The articulated model is operated by turning a hand crank, which enables the instructor to show every stage of ignition, combustion, scavenging and gas-air mixture intake. Piston and valve movements are reproduced accurately and a small blue light "fires" tc simulate the correct spark timing. The crankshaft, the cams actuating the valves, and the connecting rod assembly



are true to scale and open to inspection and study by the students. The model is one yard square, one foot thick and weighs about 75 lbs.

New Truck Registrations*

	February 1941	January 1941	February 1940	TWO MONTHS 1941	TWO MONTHS 1940	Per Cent Change, 2 Months 1941 over 1940	Per Cent of Total Two Months 1941	Per Cent of Total Two Months 1940
Chevrolet	18,100	20,144	13,789	38,244	29,786	+ 28.9	32.52	34.49
Ford	16,830	16,175	11,960	33,005	25,242	+ 30.8	28.06	29.23
International	7,305	7,573	4,981	14,878	10 519	+ 41.5	12.65	12.18
G. M. C.	5,513	9,163	2,638	14,676	5,780	+154.0	12.48	6.69
Dodge	4,152	4,499	4,336	8,651	8,681	− 0.3	7.36	10.05
White	1,092	909	371	2,001	793	+152.0	1.70	.92
Plymouth	747	866	767	1,613	1,485	+ 8.5	1.37	1.72
Mack	532	674	425	1,206	997	+ 21.0	1.03	1.15
Diamond T	438	447	425	885	961	− 8.0	.75	1.11
Studebaker	231	231	101	462	186	+148.0	.39	.22
Autocar	139	169	94	328	237	+ 38.4	.28	.27
Divco	154	145	180	299	323	− 7.5	.25	.37
Brockway	128	155	92	283	209	+ 35.3	.24	.24
Federal	136	125	113	261	266	− 2.0	.22	.31
Reo	90	81	4	171	15	+1040.0	.15	.02
Willys-Americar	82	82	182	164	355	− 53.8	.14	.41
Hudson	63	65	60	128	116	+ 10.2	.11	.13
Sterling	35	34	31	69	53	+ 30.2	.06	.06
F. W. D.	23	15	27	38	54	− 29.6	.03	.06
Bantam	3	11	43	14	86	− 83.8	.01	.10
Miscellaneous	107	129	105	236	235	+ 0.5	.20	.27
Total	55,900	61,712	40,729	117,612	86,379	+ 36.0	100.00	100.00

* Includes Federal Government deliveries.

New Passenger Car Registrations*

	FEBRUARY 1941	JANUARY 1941	FEBRUARY 1940	TWO MONTHS 1941	TWO MONTHS 1940	Per Cent Change, 2 Months, 1941 over 1940	Per Cent of Total Two Months 1941	Per Cent of Total Two Months 1940	FIVE MONTHS MODEL YEAR 1941	FIVE MONTHS MODEL YEAR 1940	FIVE MONTHS MODEL YEAR Per Cent Change
Chevrolet	73,682	71,151	55,661	144,833	121,606	+ 19.0	24.15	25.08	376,728	271,191	+ 39.0
Ford	54,591	52,088	37,712	106,679	80,566	+ 32.4	17.79	16.62	249,662	206,356	+ 21.0
Plymouth	34,515	35,219	28,923	69,734	61,910	+ 12.8	11.63	12.77	186,324	128,123	+ 45.5
Buick	24,400	26,273	17,749	50,673	40,857	+ 24.1	8.45	8.43	139,665	115,827	+ 20.6
Pontiac	23,767	22,346	14,045	46,113	30,249	+ 52.6	7.69	6.24	117,649	80,677	+ 45.8
Oldsmobile	19,606	19,247	12,508	38,853	26,649	+ 45.0	6.48	5.50	99,107	73,414	+ 35.0
Dodge	15,179	16,661	14,556	31,840	31,070	+ 2.6	5.31	6.41	75,482	58,189	+ 29.5
Chrysler	10,405	10,801	7,073	21,206	14,447	+ 47.0	3.54	2.98	48,806	26,508	+ 84.0
Studebaker	7,531	7,991	6,569	15,522	13,716	+ 13.0	2.59	2.83	42,439	39,455	+ 7.2
Mercury	6,824	7,061	5,610	13,885	12,344	+ 12.6	2.32	2.55	33,480	30,794	+ 8.9
Nash	6,594	5,607	3,582	12,201	7,917	+ 54.0	2.03	1.63	25,326	21,821	+ 16.0
De Soto	6,023	6,132	5,076	12,155	10,213	+ 19.0	2.03	2.11	30,074	19,873	+ 51.0
Hudson	5,162	5,423	5,216	10,605	10,953	− 3.1	1.77	2.26	30,934	35,535	− 13.0
Cadillac	4,685	5,145	2,237	9,830	5,122	+ 92.0	1.64	1.06	23,709	15,571	+ 52.2
Packard	4,087	4,496	4,875	8,583	10,146	− 15.4	1.43	2.09	27,120	33,259	− 18.5
Lincoln	1,544	1,639	1,543	3,183	3,551	− 10.4	.53	.73	8,646	8,848	− 2.2
Willys-Americar	1,497	1,438	1,479	2,935	3,157	− 5.4	.50	.65	7,831	8,945	− 12.5
Graham	85	133	24	218	60	+263.0	.04	.01	749	310	+141.5
Crosley	26	42	36	68	87	− 22.0	.01	.01	179	245	− 26.9
Bantam	18	25	97	43	175	− 75.4		.04	142	427	− 66.8
Miscellaneous	225	211	24	436	47	+828.0	.07		1,582	174	+788.0
Total	300,466	299,179	224,625	599,645	484,841	+ 24.0	100.00	100.00	1,525,634	1,175,542	+ 29.8
Chrysler Corp	66,122	68,613	55,628	134,935	117,640	+ 14.8	22.50	24.26	340,686	232,693	+ 46.5
Ford Motors	62,959	60,788	44,895	123,747	96,461	+ 28.0	20.64	19.90	291,788	245,998	+ 18.8
General Motors Corp.	146,140	144,162	102,200	290,302	224,432	+ 29.0	48.41	46.30	756,858	556,680	+ 36.0
All Others	25,245	25,416	21,902	50,661	46,258	+ 9.8	8.45	9.54	136,302	140,171	− 2.5

*Includes Federal Government deliveries.

MEN . . . . . .

William H. Boney has joined the Chicago staff of the Motor & Equipment Wholesalers Association to direct its catalog service. He was associated with the Beard & Stone Electric Co., Houston, Texas, for the past 16 years.

E. E. Miller has been elected vice-president of the De Kalb Commercial Body Corp., De Kalb, Ill.

Goodyear Tire & Rubber Co., Akron, announces the following appointments: **Butler Doolittle,** manager of car and home supplies; **Lee J. Bornhofen,** sales promotion manager; **Galen G. Cartwright,** assistant manager of advertising service; **Robert E. Lee,** superintendent of Jackson, Mich., factory; **E. D. Sheahan,** superintendent of Plant 2 in Akron.

James R. White, formerly president of Rickard & Co., New York industrial advertising agency, is now director of sales for the Clover Mfg. Co., Norwalk, Conn.

Albert J. Proctor, a superintendent of the AC Spark Plug Division, has been elected president of the Flint Industrial Executives Club. The other officers follow: **Cecil P. Nankervis,** Fisher Body, vice-president; **Fred Pyper,** Buick, treasurer; **Earl Van Dyke,** Chevrolet, secretary.

James D. Redding, former assistant chief of the Aircraft Airworthiness Section, Civil Aeronautics Administration, has joined the New York staff of the SAE and will be in charge of its aeronautical activities. He succeeds **Carleton E. Stryker,** who was released to serve with the OPM as coordinator of aeronautical standards.

William Smila has been named master mechanic of the Plymouth Division, Chrysler Corp., succeeding **Otto W. Franke,** who has been transferred to the Dodge Division as general master mechanic. Smila formerly was master mechanic at the Chrysler-Jefferson plant.

C. F. Watson has been appointed sales manager of the truck division of Studebaker Corp. He formerly was regional manager of the Cleveland branch.

E. R. Kroblen has been named general sales manager of Reo Motors, Inc., succeeding **Frank N. Morgan,** resigned. Kroblen has been with Reo for 25 years, the last three as manager of the Chicago branch.

George C. Paterson, resident manager of Fisher Body No. 1 plant at Flint, has been appointed general factory manager of all Fisher Body assembly plants, with headquarters in Detroit. He succeeds **J. J. Cronin,** who becomes director of industrial relations for the division. **James E. Goodman,** assistant manager, will become Fisher Body No. 1 resident manager. **George Morgan,** works manager of Fisher Body No. 1, has been transferred to Fisher Body plant No. 23 at Detroit as resident manager and **J. W. Richardson,** now assistant works manager at Fisher Body No. 1, will advance to the post of works manager. **Leonard T. Dalecke,** manager of the Fisher Body plant at Janesville, Wis., has been appointed resident manager of the Fisher Body Tennessee Division, which will coordinate the manufacture of subassemblies for army bombing planes at Memphis. **H. D. Burnside,** manager of the Fisher Body Buffalo plant, will succeed Dalecke at Janesville and **C. A. Trump,** assistant manager at Kansas City, has been named to the Buffalo post. **Keith Spurrier** has been appointed vice-president and resident manager of the Fisher Lumber Co., Memphis.

Stanley G. Mitchell, formerly advertising manager of Federal Motor Truck Co., has been placed in charge of axle advertising for the Timken-Detroit Axle Co. **William C. Chappell** continues as advertising manager, specializing on the oil burner division.

Ray Ayer has been appointed sales executive of the Plymouth Division of Chrysler Corp. He formerly was on the Chrysler Corp. central sales staff.

H. Oliver West, formerly assistant to the president, has been elected executive vice-president of the Boeing Airplane Co. and its subsidiary, Boeing Aircraft Co.

Joseph Stross has been named purchasing agent of the Metal Speciality Co., Cincinnati. He formerly was buyer for the Crosley Corp., with whom he was associated 16 years.

Ralph M. Hoffman has been elected a vice-president of the Link-Belt Co., Chicago, in charge of the general supervision of sales.

Anthony J. Chenis is now head of the Bullard-Dunn process laboratory of the Bullard Co., Bridgeport, Conn.

S. H. Kehoe has been named manager of the automotive division of the Farnsworth Television & Radio Corp., Detroit. **W. H. Myers** joins the staff as automotive radio engineer.

W. H. Pritchard is now assistant purchasing agent of Kearney & Trecker Corp., Milwaukee, Wis.

Benjamin Stevenson

Benjamin Stevenson, general superintendent of the Federal Motor Truck Co. until his retirement in 1938, died April 11 at Traverse City, Mich. He was with Federal for 12 years and prior to that was associated with Rickenbacker, Saxon, and Winton.

Russell Page

Russell Page, former general sales manager of Chrysler Corp. of Canada and later general service manager of the Dodge Division, was killed April 10 in an automobile accident.

THIS LATEST Stuart Oil DEVELOPMENT IS DOING IT FOR OTHERS!

THE rapidly increasing use of carbide and other high speed tools emphasizes the immediate importance of this original type of cutting fluid.

STUART'S SOLVOL Liquid Cutting Compound *was developed especially for this exact condition.* Where operations run "too hot" for properly applied straight cutting oils — and where ordinary soluble cutting oils or soluble paste compounds fail to produce satisfactory finish or tool life — that's the place for this original Stuart Oil development in emulsifying cutting oil! *Put it on the job quick and watch the improvement.*

WIRE TODAY *for working sample — FREE to any industrial concern working on defense orders. To assure proper application please tell us name of part, stock, machine and cutting operations.*

For All Cutting Fluid Problems

D. A. STUART OIL CO.

Chicago, U.S.A. • LIMITED • **Est. 1865**

Warehouses in All Principal Metal Working Centers

Truce Averts Mass Walkout at General Motors Plants

Corporation and Union Officials Agree to Continue Operations Pending Hearing; All Ford Units in Production

A threatened strike in 60 plants of the General Motors Corp. was averted at least temporarily when UAW-CIO and General Motors officials agreed to accept the proposal of the National Defense Mediation Board to continue production pending the outcome of a hearing scheduled by the board for May 2 at Washington. It was stipulated that "any agreement reached in settlement of the dispute will be made retroactive to Monday, April 28, 1941." Meanwhile, negotiations over the amending the continuing contract between General Motors and the union continued in Detroit. On April 18 the UAW-CIO filed notice of its intent to call a strike in General Motors plants.

Simultaneous with filing of strike intent, President Roy J. Thomas, of the UAW-CIO, called a strike vote in 45 General Motors locals covering 69 plants throughout the country. Previously, locals in 49 of the corporation's 65 plants had voted to authorize the union to call a strike vote if negotiations over amendment of the GM contract broke down. In calling the strike vote, however, the union excepted 13 plants engaged in national defense work. These were the Allison Engine Division, Indianapolis; Allison division of Cadillac, Detroit; aluminum foundry, Anderson, Ind.; Detroit and Cleveland Diesel divisions; new Buick aircraft engine plant under construction at Melrose Park, Ill.; Rochester (N. Y.) Products Division; Frigidaire Division, Dayton, O.; Olds Motor Works forge plant, Lansing; Delco Products Division, Dayton, O.; and three Canadian plants.

Despite this ex epting of plants with defense contracts, the Michigan Labor Mediation Commission decided that a 30-day strike notice would be required of the union because of the "public interest" involved rather than the usual 5-day notice. The union said it would ignore the 30-day requirement, awaiting the completion of the strike vote before deciding the next move. The 5-day notice expired April 23.

Wilson Cites Michigan Contracts

Countering the union's strike notice, C. E. Wilson, General Motors president, stated that 12 of the corporation's Michigan plants had defense orders totaling $315,833,575, and that only three of the 12 had been excepted by the UAW-CIO in the strike vote. The defense orders listed were AC Spark Plug, Flint, $24,415,495; Saginaw Steering Gear, $12, 381,886; Chevrolet Motor, $13,927,000; Fisher Body, $14,-215,139; Research laboratories, $254,-340; and the following pending: Buick Motor, $91,243,800; Olds Motor Works, $9,225,000; Pontiac Motor, $17,306,000; Fisher Body, $50,000,000. Only plants excepted by the union were Cadillac Division of Allison, $24,346,017; Olds Motor Works forge plant, $9,655,000; and Detroit Diesel, $4,621,289.

Walter P. Reuther, director of the General Motors Dept. of the UAW-CIO, said a careful study had been made of defense orders and workers engaged in such activity would be advised to remain on the job. General Motors officials maintained it was impossible to segregate defense from non-defense work in many plants.

Negotiations between General Motors and the union over amendments to the continuing contract began March 11, being held three times weekly. On April 11, Reuther sent a telegram to the OPM advising that a strike threatened, saying, "After 5 weeks of negotiations, General Motors has repeatedly attempted to force a deadlock in negotiations on questions of union recognition in order to evade negotiations on other points."

Felt...
THE MATERIAL OF MANY AUTOMOTIVE USES
Whether your business requires felt products made and cut to standard or "special" specifications, Western Felt Works is equipped to give you prompt service on these quality felts:
Floor-Board Anti-squeak Strips
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Sheet Felt for Polishing and Rubbing
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Write Today for Quotations
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Also Acadia Molded Synthetic Rubber Products
BRANCH OFFICES IN ALL PRINCIPAL CITIES
WESTERN
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Acme

New Wing Design Adds Speed to Army and Navy Warplanes

100 per cent efficiency is claimed for this highly specialized wing shape. Top view is shown of model stolen recently from Manta Aircraft Corp., Los Angeles

James F. Dewey, ace federal conciliator, entered the negotiations April 17. Agreement was reached on production methods, time studies, definition of umpire's powers and grievance procedure. Demands of the union upon which the negotiations appeared to be stalled were (1) the union shop clause requiring all employes to join the UAW-CIO within a specified time; (2) general wage increase of 10 cents an hour; (3) 80 hours' of vacation pay instead of 40; and (4) "adequate compensation" for drafted workers.

Ford Dispute

Employes of the Ford Motor Co. Rouge and Lincoln plants awaited an NLRB election some time in May to decide the future of collective bargaining there. In the strike settlement reached April 11 by cooperation between Dewey and Gov. Van Wagoner, ending the 10-day strike, it was provided that five of the eight men accused of instigating the strike be returned to work, the cases of the other three to be arbitrated; that a method of grievance procedure be set up with a committee composed of Gov. Van Wagoner, Dewey, two company and two union officials, and that both parties expedite the holding of the NLRB election. The settlement was reached after the NLRB agreed to postpone until after the election a hearing against the company on unfair labor charges involving 253 dismissed employes.

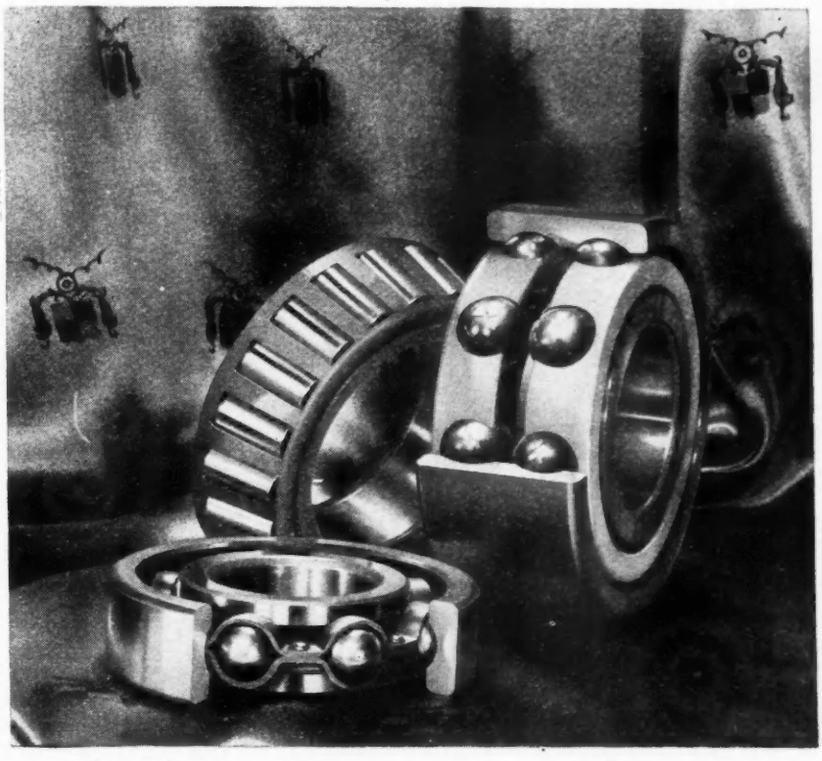
Work at the Rouge plant resumed April 14 and was scheduled to start April 28 at 15 branch assembly plants.

General Motor Employes

General Motors Corp. had an average of 299,549 hourly and salaried employes on its payroll during the first quarter of this year as compared to 247,678 employes for the same period of 1940. Wages and salaries for the 1941 first quarter amounted to $157,786 261 and for the corresponding period last year the disbursement was $114,578,562.

Arc Welding Foundation Sponsors Award Program

A $200,000 Industrial Award Program, offering 458 awards ranging from $100 to $13,700 is being sponsored by the John F. Lincoln Arc Welding Foundation, Cleveland, Ohio. The program is broader in scope than previous offers and is established for "the best studies reporting advances and improvements resulting from the application of arc welding to the products, structures and work of industry."



A New Challenge to Friction

Ball Bearings with raceways honed to the mirror-like mechanical beauty of an expensive laboratory sample, yet produced in volume by a patented process which permits the use of this superior construction in commercial products . . . THAT'S THE NEW CHALLENGE TO FRICTION, made by HOOVER ENGINEERS. Hoover Ball Bearings with Honed Raceways establish new standards of uniformity and exactness in precision, smoothness and quietness, with corresponding increase of load-capacity and extended life. They give American Industry a new weapon for use in the war against friction!

HOOVER

The Aristocrat of Bearings

WITH HONED RACEWAYS . . . AN EXCLUSIVE HOOVER FEATURE

HOOVER BALL AND BEARING COMPANY, ANN ARBOR, MICHIGAN, U. S. A.

Accredited List of ECPD Includes 125 Institutions

In the eighth annual report of Engineers' Council for Professional Development, just published at 29 West 39th Street New York, there are listed 125 educational institutions in the United States and Alaska that have been accredited by the E.C.P.D. The Engineering Institute of Canada affiliated with the E.C.P.D. in October, 1940. A committee on student selection and guidance reports further progress in the study of aptitude tests and, especially, advance in the promotion of proper selection of engineering as a career by high-school boys. Professor emeritus Charles F. Scott of Yale University urges the various organizations of the Council to encourage emphasis on ethics, the teaching of ethics, and the professional spirit among engineering students, in order that they may acquire a full conception of the profession as early as possible.

Michigan Tool Co.

Michigan Tool Co., Detroit, has been elected to membership in the American Gear Manufacturers' Association.

Wells SAWS
THE SIGN OF SERVICE
YOUR GUIDE
to More
Efficient
METAL
CUTTING
Now Built in 3 Sizes
No. 5—5" dia. round or 5" x 10" flat.
No. 8—8" dia. round or 8" x 16" flat.
No. 12—12" dia. round or 12" x 16" flat.
Also the No. 9 Upright Saws

SERVICE!—from the factory—from the distributor—and from the SAW!

Wells Saws give you big capacity, speed, accuracy and simplicity to handle production work, odd jobs or maintenance work and handle it efficiently. They're real all-around tools that every plant can use—several hundred plants have installed their second and third and *more*. Write to Wells today for complete information. You'll be glad you did.

WELLS MFG. CORP. Three Rivers, Michigan

PUBLICATIONS

A new 32-page catalog, No. 41, of Kennametal **steel cutting tools and blanks**, by McKenna Metals Co., lists specifications and prices of various styles of blanks, standard tools, etc.*

Gage Blanks (Third Edition), Commercial Standard CS 8-41, which contains industry's accepted standard of practice for gage blanks and component parts effective Jan. 1, 1941, for new production, is now available through Supt. of Documents, Washington, D. C. Price 15¢. This pamphlet is the latest edition published by the Natl. Bureau of Standards on that subject.

"Bolts, Nuts & Screws" is a 72-page book by Lamson & Sessions Co. It contains discussions on engineering, design and production of headed and threaded products.*

Ampco Metal, Inc., is distributing a cardboard **slide selector** by which the physical properties and chemical composition of all grades of Ampco Metal may be quickly ascertained. The reverse side of the selector contains a table listing the general uses of the alloy by grades.*

Bendix Products Division, Bendix Aviation Corp., has the following new booklets: **"Stromberg Built-In Features"** — the reasons behind Stromberg carburetor design; **"The Modern Way"** — pointing out advantages of replacing worn brake shoes with factory-lined shoes; **"Bendix Cleaner"**—telling the origin of the cleaner, what it does and how it is used, and **"Profit Opportunity in Bendix-Lined Shoes and Shoe Exchange"** —a sales story on new factory-lined brake shoes and shoe exchange.*

The Right and Wrong of Hob Sharpening, by Illinois Tool Works, points out common causes and effects of incorrect sharpening and how they may be eliminated.*

Continental Diamond Fibre Co.'s folder, "What Material?" covers **five important basic types of non-metallic materials** and presents data for designers and production men to determine quickly whether or not they can be used to advantage.*

Fruehauf Trailer Co. has a new catalog comprehensively presenting the **Fruehauf line.** Included are a number of new body types and descriptive material on new stainless steel vans.*

Catalog No. 241, by Blackhawk Mfg. Co., features many 1941 developments in **socket, box-type, open-end and tension wrenches.***

Inventory Control Methods, a booklet compiled by the Policyholders Service Bureau of Metropolitan Life Insurance Co., is a report based on data contributed by a number of industrial companies that are believed to have developed sound practices in controlling inventories of supplies, materials and finished goods.*

A new series of five folders on Ex-Cell-O Precision Boring Machines illustrating the five standard Ex-Cell-O Corp.'s machines for **boring, turning, facing, etc.**, has just been released.*

The complete line of Gisholt **Turret Lathe Tools** for use on ram and saddle types of turret lathes is described and illustrated in a new 168-page, loose-leaf catalog published by Gisholt Machine Co., 1205 East Washington Ave., Madison, Wis.

Westinghouse Elec. & Mfg. Co. has a new leaflet describing its **compressed air circuit breakers;** a circular describing its **oil circuit breakers** for starting motors; a new 15-page booklet describing **type BJ voltage regulators** for generators with indirect acting exciters and a bulletin covering **portable substations,** designed to meet a wide range of operating conditions.*

Portfolio AG-77, published by Chicago Metal Hose Corp., Maywood, Ill., gives specifications and data on its **flexible connections, flexible conduits, and fittings** for aircraft use.

* Obtainable through editorial department, AUTOMOTIVE INDUSTRIES. Address Chestnut and 56th Sts., Philadelphia. Please give date of issue in which literature was listed.

CENSORED

An exclusive feature prepared by the London correspondent of AUTOMOTIVE INDUSTRIES, M. W. Bourdon.

Now that the Lease-Lend Act has eliminated one of the reasons why the importation of American vehicles was prohibited at the outbreak of war, namely, the conservation of dollar exchange, attempts are being made to induce the Government to permit American trucks to be imported when proof can be furnished that the present severe and increasing shortage of trucks in civilian service is impeding the national effort.

* * *

When British truck manufacturers are permitted to resume their normal activities at the end of the war, they should have no difficulty in keeping their plants working to capacity for many months if not for a year or two fulfilling orders already in hand in "waiting lists" that lengthen with every week that passes. Fleet operators in some, if not many cases, are anticipating that war time use of existing trucks will necessitate at least one-third of the latter being replaced at the earliest possible moment after the war and are ordering in advance on that scale.

* * *

It is revealed in the annual report of the London Passenger Transport Board that since the early days of the war the board has had a special organization in being with an emergency fleet of 600 double-deck buses, and a reserve fleet of 300 more, for use when required as a result of air raids. The fleet has been used on a number of occasions to supplement or replace interrupted services on the suburban railroad systems, as well as the board's own railroad, tramcar and trolley bus services.

* * *

As a result of representations made by the Society of Motor Manufacturers to the income tax authorities the latter have agreed to a 50 per cent increase in the rates of depreciation allowed in respect to plant and machinery working continuously — treble shift or double shift with overtime—in aid of the national effort.

* * *

The Minister of Transport has refused, in the public interest, to reveal how many motor vehicles, classified by type and power, were licensed at corresponding dates in 1940 and 1941, respectively.

Wright Engine Shipments in March 1,430,000 Hp.

Cyclone and Whirlwind aircraft engines totaling 1,430,000 hp. were produced during March by the Wright Aeronautical Corp. Paterson, N. J. This output surpasses the projected production program scheduled a year ago by the National Defense authorities and also established a new monthly high for the company. It represents a 23 per cent increase over January, 1941, and a 500 per cent increase from the normal of September, 1939. By July of this year, the company's five Paterson plants are scheduled to reach a monthly output of about 1,780,000 hp.

Wright production will be augmented greatly when its new 50-acre plant at Cincinnati gets in full production, which is estimated at 2,000,000 hp. monthly. The first engines are scheduled to come off the line in June.

Harry Eastman

Harry Eastman, former distribution manager for the Chrysler Corp. of Canada and assistant sales manager of the Canadian DeSoto Division, died April 10 at Detroit. Recently he was associated with a Detroit automobile dealer.

More than Good Luck...
PRECISION
Dole THERMOSTATS
The Dole Line of Automotive Thermostats includes models for motor block and hose line installation...both Poppet and Butterfly Types... with and without nipples for hot water heater connection. All models assure reliable automatic control of engine temperature under varying road, load, and weather conditions... are proof against leak, seepage and wear.
THERMOSTATIC BI-METAL
Dole Thermostatic Bi-Metal... made to exacting specifications by time-tried procedures that assure complete uniformity of quality...can be purchased in (1) Sheets up to 14 inches wide; (2) Strips any width; (3) Coils, as long as 1000 feet; (4) in diversified fabricated parts such as spiral or helical coils, hairpin or U-shapes, flat strips, etc.
Dole FITTINGS
and Special Parts
Compression couplings for all tubing connections and a complete assortment of water line and hose parts for automobile hot water heaters... all built and factory tested to withstand severe vibration and strain. Also special brass parts from customer's blueprints... to his specifications.
THE DOLE VALVE COMPANY
1901-1941 Carroll Ave., Chicago, Ill.
Detroit Office: 6432 Cass Ave.
DOLE
THERMOSTATS

Metal Prices

(*Continued from page* 490)

Resellers of cadmium have been warned that drastic measures will be taken by the authorities to check price rises in that bearing metal. It is pointed out that current output is 25 per cent ahead of that of last year. Smelters quote the metal at 90 to 95 cents.

In a report, current in London, that a maximum price for tin would be established here, is seen a desire to curb speculative activity in that metal on the London Metal Exchange and at Singapore. The British authorities are seeking to co-operate with those at Washington in holding tin prices on an even keel. The market for Straits tin here is sufficiently above the Metals Reserve Co.'s 50-cents buying price, to keep importers interested, but any sharp rise would undoubtedly meet with corrective measures.

Metal Savings by Auto Curtailment

The automobile industry in 1939 consumed about 16.7 per cent of the nation's rolled steel. On the basis of 1939 figures, adjusted to the current domestic production of automobiles and trucks, it is estimated that during the 12 months ending this April, automobile consumption of steel will aggregate 8,000,000 tons, of which 2,400,000 tons is alloy steel. A 20 per cent reduction in motor vehicle production, a ratio that may later be increased, would mean a saving of 1,600,000 tons of steel. In itself not a large figure as measured against steel capacity, similar reductions in other large consuming lines will reach a substantial total, and it is quite conceivable the per cent cut will be increased if found necessary.

Reduced steel supplies for the automobile industry is given great significance as it bears on defense requirements. The kinds of steels it uses, particularly alloys and sheets, are especially pressing defense requirements. In the first two months of the current year, sheet production, a substantial proportion of which went to automobile manufacturers. totaled 2,223,919 tons or 22 per cent of the total semi-finished and finished steel output. In February sheet production was 1,093,293 tons or 107.3 per cent of capacity.

Estimated savings of other defense materials as the result of the one million unit cut and based on 1940 consumption are: aluminum—5000 tons; copper—26,500 tons; tin—2400 tons; lead—55,000 tons; zinc—18,200 tons; nickel—2400 tons; malleable iron—68,500 tons; gray iron—227,300 tons; crude rubber—113,600 long tons; plate glass—28,250,000 sq. ft.; cotton—176,000 bales.

HOLTITE-Phillips Recessed Head SCREWS & BOLTS

are as Time-Saving and Efficient as a Zipper

Assembling time reduced to 50% and more . . . spoilage and injuries eliminated! These are the highly profitable features that have made HOLTITE-Phillips screws, bolts and allied fastenings the choice of progressive manufacturers who have adopted faster driving methods to speed deliveries and cut costs. • • Regular HOLTITE products, and Specials, offer every user an unlimited range of fastenings that can be profitably used in the assembly of practically every manufactured product.

CONTINENTAL SCREW COMPANY

New Bedford, Mass., Warehouses at Detroit and Chattanooga

Francis Edwin Brown

Francis Edwin Brown, chairman of the board of David Brown & Sons Ltd., and associated companies, Huddersfield, England, died recently at his home in Somerfield. He was a pioneer in the field of machine cut gearing and in the development of the worm gear. In 1912 he concluded an agreement with the Timken Detroit Axle Co. for the production of David Brown worm gears in the United States.

Propaganda? Yes! For Americanism

Editor of AUTOMOTIVE INDUSTRIES:

For a number of years I have subscribed to the AUTOMOTIVE INDUSTRIES magazine, entirely for the technical information which it carries. I have never observed that its pages were used for propaganda purposes.

I believe that articles such as appear on page 442 of the April 15 issue* are a particularly vicious type of propaganda, as they show only one side of the question. If it is to be the editorial policy of AUTOMOTIVE INDUSTRIES to print propaganda of this type with its technical information, please cancel my subscription. There are already enough sources of this kind of material, and I refuse to have my technical information diluted with it.

Sergius Vernet, President,
Vernay Patents Company,
Yellow Springs, Ohio.

* Photograph and caption, strikers engaged in mob beating of Ford worker.

Navy Anti-Aircraft Guns

(*Continued from page* 489)

been let. Construction began March 17.

The 10-day strike at the Ford Rouge plant early in April set back construction on the Ford aircraft engine factory about three weeks. Construction workers could not pass the picket lines and when work resumed, many of the building tradesmen had taken other jobs. This slowed up the contractors. However, the company still hopes to turn out the first of the 2000-hp. Pratt & Whitney aircraft engines in June.

Mack Mfg. Corp., of Long Island City, N. Y., has received a contract for $9 907,427 for transmission control differentials and final drive assemblies for Army tanks. A further award of $282,000 has been granted to provide machinery and equipment in Mack plants at Allentown, Pa., New Brunswick and Plainfield, N. J., for production of these parts.

Recent National Defense orders include $13,076,048 to Fisher Body Division of GM for naval ordnance, including gun mounts; $325,710 to American Bosch Corp., Springfield Mass., for magneto assemblies; $119,597 to Continental Motors Corp., Muskegon, for hardware; $1,029,915 to Nash Motors Division of Nash-Kelvinator Corp. for army trailers; $123,807 to Electric Auto-Lite Co., LaCrosse, Wis., for gage assemblies; $3,410,500 to Ford Motor Co. as an educational order for airframe assemblies; $992,389 to Delco Products Division of GM. Dayton, Ohio, for strut assemblies, and $624,332 to Standard Steel Works, North Kansas City, Mo., for trailers and dollies.

Business in Brief

(*Continued from page* 473)

policy that, while shaken somewhat by the defense program, has been maintained to a considerable degree. Those taking the view that a new policy designed to develop defense production to the highest point possible look for the OPM to request other industries to fall in line with the automobile industry and curtail civilian output and divert greater production to defense demands.

In a letter to the OPM, A. P. Sloan, Jr., announced General Motors intention to continue 1942 models through 1943. He said that this would make tool shops, equipment and technical talent available for defense work. It also will effect a saving of $35,000,000 to $40,000,000 in tooling costs. Ford and Chrysler are still working on 1942 model plans, but both place defense work ahead of automobile production and are willing to forego 1943 changes.

Despite the strike at the Ford Rouge plant, which cut the month's production by at least 70,000 units, April output was estimated at 467,000 vehicles, a gain of nearly 15,000 units over April, 1940, and the biggest total for the month since 1937. However, it marked the first month since September that production has fallen below the 500,000 mark.

Production was estimated at 102,500 units for the week ending April 19, and then it climbed to 104,000 units in the following week. General Motors turned out approximately 54,300 vehicles in the latter week, with Chevrolet passing the 900,000 mark in 1941 model production. Chrysler divisions were manufacturing close to 6000 cars and trucks per day, according to Pres. K. T. Keller, with the week's output estimated at 28,400 units. Studebaker topped the independents, followed by Nash, Hudson, Packard and Willys.

Although the Ford Rouge strike by the UAW-CIO lasted only 10 days, ending April 11, it resulted in a 3-week suspension in final assemblies due to the time required to resume full production. Thus only 3900 vehicles were turned out in the week ending April 26 and the 5000 per day mark was not expected to be reached until early May.

Retail sales continued to hold at record levels. Deliveries to consumers for March totaled 525,798 units, according to the Automobile Manufacturers Association, the biggest total for a single month since April, 1929,

ONLY LAPPING *As Strom Does It* CAN PRODUCE SUCH PRECISION

Strom Steel Balls possess a degree of surface smoothness and sphericity that has never been equalled in any other regular grade of ball. Such precision is exclusive with Strom because it can be attained only through a series of lapping operations such as are standard practice in the Strom plant.

Physical soundness, correct hardness, size accuracy and sphericity are guaranteed in all Strom Balls.

Other types of balls—*stainless steel, monel, brass* and *bronze,* are also available in all standard sizes. Write for complete details.

Strom STEEL BALL CO.
1850 So. 54th Avenue, Cicero, Ill.
The largest independent and exclusive Metal Ball Manufacturer

when the total was 527,974 units. This marked a gain of 31 per cent over March, 1940.

Passenger car sales of 449,597 units for March were up 33 per cent from the same month of 1940, while truck sales of 76,201 units showed a 26 per cent advance. Chrysler retail deliveries were running at 33,000 units per week for three weeks up to mid-April. New passenger car registrations from 16 states for March showed a 30 per cent gain over March, 1940, according to R. L. Polk & Co., indicating a total of 390,000 for the month, while commercial car registrations were up 15 per cent.

At the Johnson Plant

(*Continued from page* 472)

metal in but five operations! The routing tells the story, the operation of die casting being the only additional step required.

The Lo-Swing automatic piston lathe and the Simplex precision boring machine are the prin ipal items of equipment responsible for this accomplishment. It will be noted that the Lo-Swing lathe takes all of the machining operations in one setting for producing a finished piston, save for the precision boring of the wrist pin holes. The piston castings are presented to the machine after rough turning the O.D. on a Gisholt automatic lathe. It is of interest to note that the finishing of the O.D. in the Lo-Swing is done with a diamond tool.

The Imp Lo-Swing lathe on this operation has the same patented features as the bushing machine described later in this article. However, the piston machine does not have an automatic loading device since its productivity is lower. In order to finish the piston in one setting, the machine has been equipped with three facing and turning slides.

According to the tool layout, four turning tools are used on the front slide. The first two are carbide-tipped, rough turn the ring groove lands and the skirt. The third and fourth tools are diamond tipped, one of which finish turns the skirt, while the other is mounted in a template-controlled slide to take care of the diameters of the ring groove lands.

The longitudinal feed cam installed in this machine is of special design with two different feeding rates, the first giving a roughing feed of 0.010 in. per revolution of spindle, the second with a feed of 0.002 in. for the diamond turning tools. With this arrangement, no time is lost on the roughing part of the cycle while a high class surface is obtained with the diamond-tipped tools.

Ring grooves are rough turned and chamfered with the third arm slide tools during the rough turning part of the cycle, then finish turned with the rear slide tools after all other tools have ceased cutting, assuring close a curacy and finish.

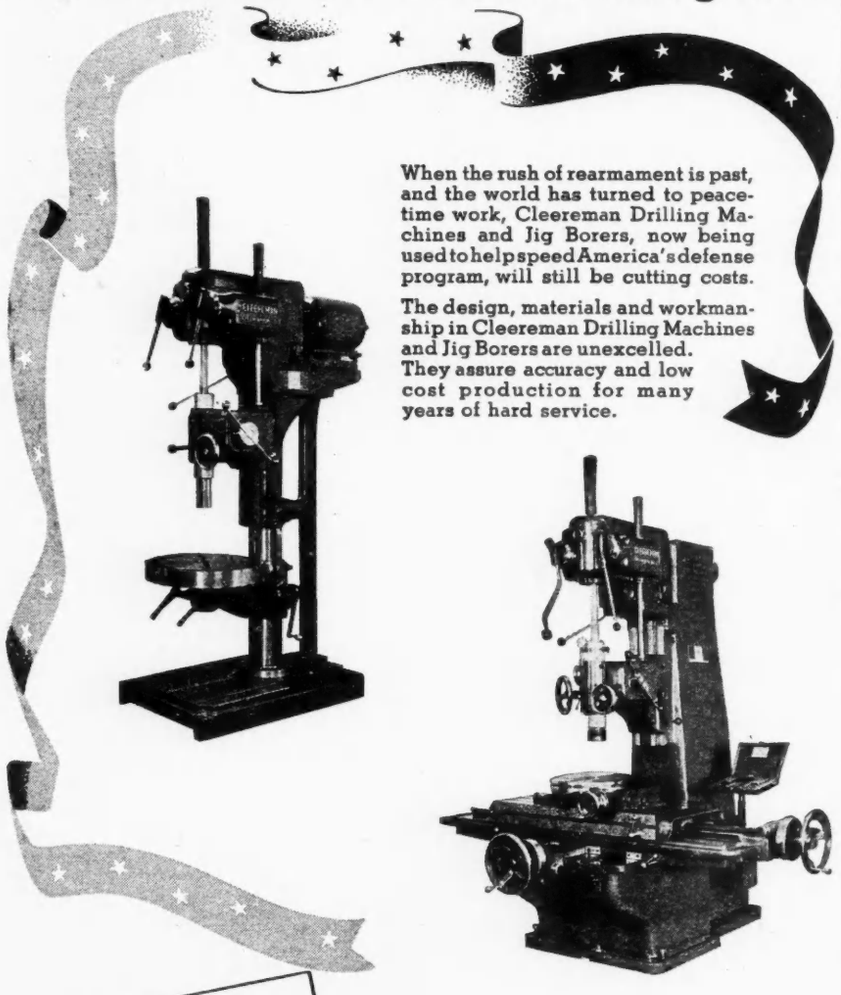
The Simplex precision boring machine for pistons is built on substantially the same principle as the machine for boring connecting rods. The chief difference lies in the fact that the piston machine has three heads mounted on each side of the trunnion fixture. Pistons are so clamped in the six-station fixture that one side of the wrist pin holes is bored by the heads on the left-hand table while the other side is bored by heads on the right-hand table. Two heads on each table are used for boring—one for roughing, the other for finishing, while the remaining heads take care of the spring lock grooving.

After the boring operation, the wrist pin holes are checked for accuracy with a Pratt & Whitney Electrolimit gage, holding the tolerance on the bore to plus or minus 0.0002 in.

In addition to the foregoing, we have shown the routings for the new flywheel, the cylinder and crankcase, and the crankshaft. The latter is a relatively simple part but, as will be noted, its machining follows steps quite sim-

When Peace Comes ☆

Cleereman Machines Will Still Be Cutting Costs



When the rush of rearmament is past, and the world has turned to peacetime work, Cleereman Drilling Machines and Jig Borers, now being used to help speed America's defense program, will still be cutting costs.

The design, materials and workmanship in Cleereman Drilling Machines and Jig Borers are unexcelled. They assure accuracy and low cost production for many years of hard service.

Address
Bryant Machinery & Engineering Company
400 W. Madison St., Chicago, Ill., U. S. A.
Sales Division of
Cleereman Machine Tool Company

CLEEREMAN

DRILLING MACHINES and JIG BORERS

ilar to the procedure on larger automotive shafts.

The unique process of furnace brazing outboard motor gas tanks was pioneered here, producing a hermetically sealed unit with excellent exterior finish and appearance, at a cost far below any previous performance. Key to this process is the special "brazing" sheet developed by the Aluminum Co. of America in which the aluminum parent metal is completely coated with a low melting point skin of aluminum-silicon composition. In the press forming operations, this coating is held on the inside surfaces of the stampings. Prior to the brazing operation, all of the component parts are chemically cleaned in a Detrex degreasing machine.

For the brazing operation, the major stampings of the gas tank are assembled loosely (i. e., without mechanical attachment), all joints being coated with a special flux. Since a large number of inserts of various kinds go into the gas tank assembly, these are staked in place, fluxed, and small segments of aluminum rod laid into the joints. In the case of inserts, a low melting rod is required to provide the brazing material.

These assemblies then are placed on a suitable tray and pushed into the Hevi-Duty electrically fired brazing furnace. The temperature required for this operation ranges around 1200 deg. Fahr., and is held within 5 to 10 deg. Fahr. variation.

The mechanism of the brazing operation is that at the temperature noted above, the low melting point aluminum-silicon coating melts and runs outward to the prepared fluxed joints, filling them completely. At the same time, the aluminum rod in the insert joints also melts and fills the insert joints. The parent metal is unaffected under these temperature conditions.

In a sealed chamber of this type it is necessary to take certain precautions to vent the entrapped explosive mixture generated during the brazing operation. Failure to do so may result in minor explosion which will break the joints. This is something that has been carefully worked out by Johnson experts.

Fabrication of gas tanks reveals another flexible procedure for making the variety of blanks and stampings required for the entire line of gas tanks used by Johnson and the other divisions of the company. Interestingly there is but one press used for all of this stamping activity. This is a Verson All-Steel No. 30½-B press, of full eccentric type with all moving parts contained within the crown. It is driven by a 10-hp. motor, weighs about 25,000 pounds, and stands 148 in. in height. It is equipped with Verson pneumatic cushions in the bed and Verson air counterbalance in the ram.

The press is provided with a full set of dies of various types sufficient to handle the work that clears through it. Newest acquisition is a No. 424 Verson Steel, double crank, flywheel drive high speed press of narrow bed construction for the progressive die stamping of silicon steel laminations for the new Alnico flywheel magneto. It has a capacity of 56 tons near the bottom of the stroke and is capable of 250 strokes per minute. It is equipped with a variable speed drive so that it may be operated at any speed in the range of 125 to 250 strokes per minute.

In addition to the progressive die, the press is fitted with a No. 3 Littell double rack and pinion automatic feed with 3½-in. rolls, and with adjustable feed in the range of 0 to 6 in. per minute. At the other end of the press a No. 3 eccentric type scrap cutter is observed.

Among the miscellaneous operations is a spectacular application of the IMP Lo-Swing lathe for machining bushings. Six different types of bushings are being turned with a minimum loss of time for change-over due to the patented universal camming mechanism. With this mechanism it is no longer necessary to dismantle the machine, since it may be modified by changing the position of a sector gear graduated to fractions of an inch.

...after 12 long years
of BEARING trouble....
Bronze bearings, carrying squeeze rolls heated with circulating oil at about 450°F., were giving lubrication trouble to a Canadian converting paper mill. "Dag" colloidal graphite has solved their high-temperature, high-pressure difficulty - they say, "For the first time in ten or twelve years we have been free from trouble on the bearings in question. We are surpised how long it lasts." ❖ ❖ ❖ "Dag" colloidal graphite blended with the petroleum oil provides the extra lubrication required under extreme conditions. ❖ ❖ ❖ Ask your oil supplier about his colloidal graphited industrial lubricants. Send for Technical Bulletin Number 130. . .
ACHESON COLLOIDS CORPORATION
PORT HURON, MICHIGAN
dag
REG. U.S. PAT. OFF.
COLLOIDAL PRODUCTS

The rapid traverse movement of the carriages also is set by changing the position of a single cam graduated for different lengths of the slow feeding cycle.

The automotive loading mechanism of this machine is composed of the following units:

An air-operated expanding arbor which holds and drives the bushings
A loading chute which is adjustable for bushing of various lengths and diameters
An air-operated loading plunger for pushing the bushings on to the expanding arbor
An air operated stripper arm and fork

The movements of the three air-operated units mentioned above are controlled and timed with adjustable cams. The movements are very rapid, the full unloading and loading cycle taking place while the front turning slide is returning to the starting position.

The machining operation consists of turning the O.D. to a finished size with the turning tool mounted on the front carriage, while the three tools on the vertical slide face to length on both ends and chamfer one end.

One type of cast bronze bushing has a diameter of 1⅛ in. and a length of 2¼ in. and is machined at the rate of 360 pieces per hour. Cemented tungsten-carbide tools are used, the cutting speed being selected to give a tool life of approximately 8 hours without changing tools.

Assembly Department

Motor assembly has been rationalized on a unit basis, again gearing engineering design to production procedures in such manner as to expedite assembly operations. As a result, the motor is found to be split up into a number of major sub-assemblies, each one self-contained and readily fitted to the main assembly. Among the major sub-assemblies are the following—magneto, carburetor, piston and rod assembly, drive shaft casing and gear casing group which are made up into the lower unit complete. Each of the sub-assemblies is handled separately on an assembly bench of its own.

The second major unit is the power head which comprises the motor proper. This unit is run-in on a stand for a brief interval before starting the final assembly. The last stage in the sub-assembly department is the assembly of the power head and the lower unit and the hanging of this assembly on the overhead monorail conveyor.

Completion of the final motor assembly is done in separate stages along the final assembly line. This consists of a number of assembly stations equipped with benches containing the essential parts such as the magneto, mounting plates, gas tanks, etc. At the start of the process the power head and lower unit assembly are taken off the overhead line and mounted on a special truck or assembly fixture which rolls on the floor following a single track rail. This rail winds about through the assembly department skirting the various assembly stations.

After the assembly has been completed, the motors are routed to final testing and inspection.

"Tooling Up" for the Ford Election

(*Continued from page* 463)

son for the challenge. This envelope is then dropped in the ballot box.

At the time of tabulating the vote, the challenged ballots are counted in the unopened envelopes. If the winning margin in the election is greater than the number of challenged votes, the latter are destroyed, because even if counted they would have no bearing on the outcome. If the vote is so close that the challenged ballots may affect the final decision, each one is reviewed on its merits by the regional NLRB director. Those allowed are taken from their outer envelopes, mixed together and then extracted from their inner envelopes. Great care is taken to prevent any identification of ballots. The eligible votes are then counted and added to the respective totals.

In the Ford election, the company and the AFL are expected to challenge

ATLAS
DROP FORGE CO
LANSING·MICHIGAN
ESTABLISHED 1906

An Ever Widening Influence in Drop Forging Perfection

From earliest automotive years Atlas has been a consistent leader in Drop Forging development. Often working ahead of precedent, this Company has given much to the industry. It created the first machinery for twisting multiple throw crankshafts; designed special heat treating equipment later adopted by the trade; collaborated with steel companies and universities in alloy steel research when the value of many alloys now in common use was unknown.

On the other hand, Atlas has been quick to accept processes and equipment that contributed to the betterment of Drop Forgings, thus maintaining a constantly modernized plant controlled by correct scientific methods.

COMPLETE LABORATORY AND HEAT CONTROL

the votes of several hundred workers who have been discharged and whose cases have been placed before the Detroit regional office of the NLRB. There were only 48 challenges in the Packard election, 46 in the Briggs poll and 624 in the big GM balloting, which was less than ½ of 1 per cent of total.

After the Ford ele tion, the ballot boxes will be sealed by the NLRB representatives and taken to the Federal Building in Detroit, where they will be left in the custody of the U. S. marshal until the official tabulation takes place on the day following the election. About 120 NLRB employes, as well as company and union observers, will participate in the counting. Seals on the ballot boxes are examined before opening and then the contents are emptied on a table. Approximately 2000 ballots are counted at each table.

The same practically fool-proof system of "checks and balances" is employed in the counting as in the voting. Each union and the company has two observers at each counting table, along with two board employes. An NLRB representative unfolds each ballot and displays it to the observers. An AFL observer records the CIO votes on one tally sheet, a CIO observer records the AFL votes on another tally sheet and a company man keeps a tally of the "no union" votes. The ballots are placed in three piles. After this initial tally, the board man counts over the votes in each pile to see if they check with the number recorded on the tally sheets.

The efficiency and honesty of the system are attested by Miller's statement that there never has been a request for a recount.

Upon the ordering of the Ford election, Harry Bennett, Ford personnel chief, made the following statement:

"This company is not afraid of a fair and impartial election and never has been. We have refused consent, however, because of the close and intimate relationship between the UAW-CIO and the local office of the NLRB. If the local office has anything to do with the election, I am afraid there will be a repetition of the Allis-Chalmers strike vote."

However, the Allis-Chalmers strike vote was a union-conducted vote and the NLRB was not involved. Experience of other automotive plants with the NLRB as far as the conduct of elections is concerned would seem to minimize Mr. Bennett's fears. Both the General Motors Corp. and the Chrysler Corp. have found the Labor Board elections fairly handled. The only complaint heard in the Detroit area was from one company which submitted its certified payroll for eligible voters, including employes' addresses, and suspected that the list or a copy of it, was used by the union in its electioneering.

The point of electioneering is a more difficult one to handle and one which the NLRB has no police power to regulate. There undoubtedly are a lot of high-pressure tactics and some intimidation employed by unions in their efforts to roll up an impressive majority in the ele tion so they can demand a better contract. Electioneering is supposed to be taboo on company property and company time. The NLRB endeavors to have the unions tacitly agree to end their electioneering the day before the election and dispense with sound trucks and demonstrations on the day of the voting. The board prohibits electioneering in the immediate vicinity of the polling place, regardless.

The UAW-CIO has poured all its resources, both financial and organizational, into the Ford organizing campaign. Last summer the UAW-CIO and its parent body, the CIO, each voted $50,000 for the Ford drive. The UAW-CIO also voted a $1 per capita assessment of its entire membership for organization purposes, especially at Ford, after a favorable referendum. A total of $144,590 had been collected on these assessments up to March 1, the major portion of this going to the Ford campaign. Sixty-seven organizers, directed by Michael F. Widman, Jr., a one-time organizer for the United Mine Workers, are conducting the Ford organizing drive. They are aided and abetted by sound tru ks, nightly radio

EXACTING demands
HANSON-WHITNEY Thread Miller
The correct oil film to each individual bearing... automatically
• Production machines developed for highest quality of performance — unfailing precision . . . greater refinement and closer limits in product . . . versatility, speed, quick set-up — naturally take advantage of Bijur automatic, metered lubrication. And the user reaps the benefit of economy as well as quality and quantity in production. Safeguarded machine accuracy — with spoilage and costly maintenance eliminated!
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BIJUR
AUTOMATICALLY Correct LUBRICATION

programs and numerous pieces of literature, including a weekly give-away paper for Ford workers. A previous ill-starred Ford organizing drive after successes at General Motors and Chrysler in 1937 culminated in the famed "Battle of the Overpass" on May 27 of that year, when a group of union officials distributing literature to workers leaving the plant was set upon and severely beaten by Ford service men. The U. S. Circuit Court of Appeals at Cincinnati last fall upheld an NLRB ruling that Ford service men were guilty of the attack and also ordered the reinstatement of 23 out of 24 employes allegedly fired for union activity.

The AFL already numbers some Ford skilled craftsmen among its members, especially in the building trades. In February the AFL chartered two federal locals at the Rouge and Lincoln plants. These were not directly affiliated with the UAW-AFL, which has a few contracts in the automotive industry but is far outnumbered by the UAW-CIO. The CIO accused William Green, AFL president, of collusion with Bennett in an effort to organize the Rouge plant. In the recent Ford strike, Homer Martin, ex-president of the UAW-AFL, attempted to lead a back-to-work movement among Negro workers, but his efforts were disowned by the AFL.

The Ford election will be the fifth big NLRB poll in the automotive industry. Before the NLRB election order, Bennett was quoted as saying, "If the NLRB orders an election, of course we will hold one, because Mr. Ford will observe the law. CIO will win it, of course, because it always wins these farcical elections . . ."

History sustains Bennett in his prediction that the CIO will win. It has never polled less than 68 per cent of the vote in four previous automotive elections. First of these was at the Packard Motor Car Co., Aug. 17, 1939. The UAW-CIO received 74 per cent of the vote, or 6090 ballots, the UAW-AFL polled 1547, and neither union 637. Next came the balloting in nine plants of the Briggs Mfg. Co., Sept. 14, 1939. The UAW-CIO gained 87 per cent of the votes, the biggest percentage so far in major automotive plants. The vote was: UAW-CIO, 13,301; UAW-AFL, 1052; neither union, 978.

The Chrysler Corp. election followed on Sept. 28, 1939. For reasons of policy, the corporation did not hold the election in the plants, the balloting being done in outside polling places arranged by the NLRB and not on company time. The UAW-CIO received 81 per cent of the votes cast. The balloting was: UAW-CIO, 40,564; UAW-AFL, 4744; neither union, 4476.

The General Motors election, held April 17, 1940, is the largest NLRB poll ever held, with 128,957 votes being cast in 59 plants. The UAW-CIO received 68 per cent, or 84,024 votes, compared to 21 per cent, or 25,911 for the UAW-AFL. The "no union" vote totaled 13,919. However, the UAW-CIO won exclusive bargaining rights in 49 of the 59 plants, the UAW-AFL captured five, an independent union won one, another voted for "no union," and three required runoff elections which eventually were won by the UAW-CIO. Subsequent elections have boosted the UAW-CIO representation to 77 plants.

The percentage of eligible voters casting their ballots in NLRB elections has been surprisingly large. Ninety-six per cent of those eligible voted in the Chrysler election, 94 per cent in the GM election and 72 per cent in the Briggs poll.

To be certified as the sole collective bargaining agent for a plant's employes, a union must poll a majority of the vote, or one more than 50 per cent of all the ballots cast.

Roy J. Thomas, president of the UAW-CIO, has predicted that his union will poll 90 per cent of the votes in the Ford election. Representatives of the AFL claim 80 per cent will vote for that union. No one professes to speak for those Ford workers who prefer neither union. The issue will be decided at the ballot boxes.

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The experience and knowledge of the entire Verson Organization is placed at your disposal to assist you in the solving of your problems. We invite you to use them to your advantage.

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HIPERSIL

a New Transformer Steel

JOINT research and development work of the Westinghouse Electric & Manufacturing Company and the American Rolling Mill Co. has resulted in the production of a new steel of high magnetic permeability, specially suited to use in transformer cores. It is known as Hipersil (high-permeability silicon steel) and is being used in commercial tranformers by Westinghouse at the present time. It appears that in chemical composition Hipersil does not differ materially from conventional silicon steel, which has been generally used for transformers and other electro-magnetic applications up to this time, the chief difference relating to the physical structure.

A crystal of any magnetic steel is cubical in form; it can be easily magnetized in the direction of the edges of the cube, less easily in the direction of a diagonal of one side, and still less easily in the direction of a diagonal of the whole cube. Ordinary silicon steel has a random grain orientation, but Hypersil is manufactured by a special process which is said to result in grain orientation in the direction of rolling, hence the material can be readily magnetized in the direction in which it was rolled. The flux-carrying capacity of the steel in this direction is said to be almost one-third greater than that of conventional silicon steel.

A good transformer steel must possess three essential qualities, viz., high permeability, low hysteresis, and high electric resistivity. A further desirable characteristic is low magnetostriction. When steel is magnetized it elongates slightly (about 0.00003 in. per ft.), and when the magnetic flux collapses, it contracts. This alternate expansion and contraction (referred to as magnetostriction) is the cause of the familiar hum of transformers. The elongation and contraction increase with the maximum flux density. It is claimed that for the same flux density the magnetostriction is materially less with Hipersil, and that with the higher flux densities normally used with it, magnetostriction is at most no greater than with the ordinary silicon steel, and that transformers in which the new core material is employed are no noisier.

Because Hipersil can be worked at higher induction density than ordinary silicon steel, the size and weight of transformers can be reduced by from 20 to 25 per cent. Thus savings are effected in steel, copper, and oil. Of course, the higher flux-carrying capacity of Hypersil can be taken advantage of also in other ways, and instead of making use of the entire gain to reduce transformer weight, it is possible to use some of it to increase transformer efficiency, to reduce the operating temperature of the transformer, or to improve the regulation, that is, to reduce the drop in voltage between no load and full load.

In conventional transformers the cores are built up of stampings of I shape. A quite different technique is employed in the new Westinghouse transformers using Hipersil. The core is wound of steel strip to the form of a link of a heavy chain. It is then impregnated with an insulating compound and baked to a solid block. This block is then sawed in two to permit of the insertion of the coils. At first it was found difficult to prevent delamination of the block on sawing and in handling; investigation showed that it was not the insulating compound that failed but the layer of oxide on the steel strip which is formed during the annealing process. To overcome this, the steel is now given a very thin glass coating, which adheres more firmly than the oxide coating.

It has been the privilege of Wyman-Gordon to participate in the engineering and manufacturing development of aviation, all along the way.
Since the dawn of aviation, Wyman-Gordon forgings have been factors in the accomplishment of the reliability of air travel.
Today, with every forging laboratory controlled, Wyman-Gordon is producing crankshafts, cams, propellers and other vital parts, night and day, at full speed.
WYMAN-GORDON
WORCESTER, MASS.
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MEN and MACHINES

(*Continued from page* 481)

THE UNIVERSAL machine head, manufactured by John Kis of Racine, Wis., can be mounted on the spindle of any machine tool by using a suitable adapter. It is used for taper-boring, taper-turning, facing, back-facing, beveling, grooving, radius-boring, straight boring, counter-boring, under-cutting, turning and recessing. In all of these operations the work remains stationary while the head revolves with the spindle. The pivoting, sliding and revolving motions of the cutting tool secured in the tool holder are determined by the set-up of the device.

Fig. 1 herewith is a cross-sectional view of a set-up in which all of the following rough- and finish-boring operations were performed by the Universal machine head in one set up, an ordinary tool bit being used: (1) facing and counter-boring of the front, 37 in. in diameter, with an extension tool holder carrying a Carboloy tool; (2) counter-boring a hole 34 in. in diameter and ½ in. deep, with the same arrangement; (3) straight-facing the hub, 16 in. in diameter, with a standard tool; (4) boring a taper (2.5 in. per ft.) of

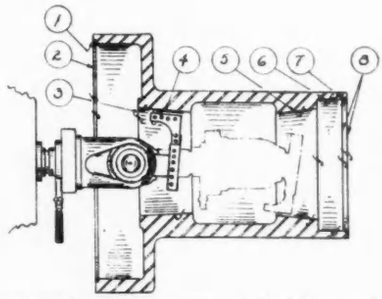


Fig. 1—Showing use of Universal machine head in facing and taper-boring operations.

14-in. diameter and 7 in. long; (5) boring a taper (2.5 in. per ft.) of 13.5-in. diameter and 5 in. long; (6) counter boring a hole of 16-in. diameter; (7) cutting a 30-deg. chamfer; (8) facing in and facing out to a diameter of 17 in.

With the Universal machine head fixtures can be faced, bored and counter-bored in perfect alignment with the spindle after being attached to the machine, without having to be shifted to other machines. The head can be used also in other machining operations, and Fig. 2 illustrates its use for taper and radius-boring, bevel and straight-facing, dove-tail grooving and taper-hub turning. Operations of this kind are required on multiple pattern plates (cope and drag), forged dies, cast molds, rubber molds, etc. No forming tools are necessary, only common tool bits are required and the results are said to be uniform.

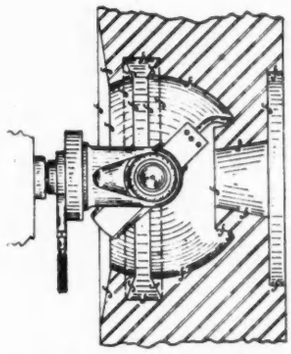
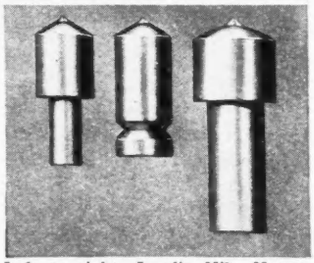


Fig. 2—Showing use of Universal machine head in radius-turning, taper-turning and grooving operations.

Diamond tools give you faster speeds, better finish, more accuracy

We make all types of shaped diamond tools to customers' blueprints.



Left to right—Landis Nib, Norton Nib, Cincinnati Nib.

TO keep up with today's urgent demand for more, and ever more, production, many manufacturers are turning to diamond tools. They are finding, as so many other resourceful concerns have known for a long time, that diamonds can speed up a number of important operations in industry. They learn that diamond tools cut at much higher speeds than others, that they give a superior finish that often eliminates the need of subsequent grinding and polishing, and that they insure greater accuracy that reduces the proportion of rejections.

If you have more orders than you can handle, or if you are waiting for the delivery of machine tools you have ordered to increase production, it will pay you to investigate the use of diamond tools. You may find them capable of sufficient additional capacity to take care of your present requirements.

With thirty years of experience in the application of industrial diamonds, we will be glad to advise you. We carry large stocks of Bortz, Carbons, Ballas, Cleaved or Natural Points, Diamonds for Dies, Glazier's Diamonds, Phono Points, Crushing Boart, Splint, Powder, etc. Send for illustrated folder and prices, or send blueprints for quotations of shaped tools.

ANTON SMIT & CO., INC.
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THE SPARTON Vibromatic cleaner, a new product of the Sparks-Withington Company, Jackson, Mich., operates by compressed air and attaches to any standard air outlet. The mechanism transforms the steady pressure into a pulsating action of 2000 cycles per minute, which is claimed to remove hard dirt, dust and sand from any surface at which it may be directed. The unit comes complete with high-pressure hose, fabric-wound extension tubing and cloth receiving bag, as well as with an attachment for removing water and cleaning fluids. In addition to being used for cleaning the interiors of automobiles, airplanes and railroad cars, it is being used by manufacturers for cleaning up shavings, dust and accumulations of fine metal scrapings in a variety of manufacturing operations.

BALDOR ELECTRIC CO., St. Louis, Mo., has developed a new 6-in. grinder known as the Baldor No. 612. It is rated 1/3 hp. and is furnished with wheels of 6-in. diameter and ¾ in. wide. This new grinder has fully-closed guards; tool rests which are adjustable horizontally and vertically, and which may be tilted for angle-grinding and adjustable, shatter-proof eye shields. It is powered with a capacitator-type motor.

A STANDARD type of carbide-tipped boring bit has been placed on the market in six standard styles by McKenna Metals Co., Latrobe, Pa. It has a 12-deg. positive back rake which, combined with a compound front clearance angle, provides firm support to the cutting edge while allowing ample clearance, company engineers point out. The front clearance angle on the tip of the tool is 0 deg. and the secondary clearance angle amounts to 10 deg. on the shank. Back rake and clearances are standard, but side cutting edge angles and end cutting edge angles vary for the different styles to fit the needs of most boring jobs where bits are held in boring bars from a 90-deg. to a 45-deg. angle, both for boring straight through and for cutting up to a 90-deg. shoulder.

SIMPLIFIED welding is claimed as the outstanding feature of the Ideal Weldmaster, a new a.c. electric arc welder manufactured by the Ideal Commutator Dresser Co., Sycamore, Ill. In addition to the transformer, the machine includes a reactance winding on a separate core that acts as a stabilizer to make it easy to strike an arc and to hold it. Fifteen different welding heats are provided between 20 and 175 amp. The standard welder is for 230 volt, 60 cycle operation.

A NEW babbitted "Common Flat Box" with maroon-colored crackle-finish housing has been announced by the Link-Belt Company, Chicago. Designed for moderate speed and power

"Toughest Job in the Plant" Made Easy with CURTIS Hydraulic Lifts!

Five years ago the Long Island City plant of the National Sugar Refining Company installed two Curtis Hydraulic Lifting Cylinders operating two platform lifts. Since that time they have operated almost continuously, 8 hours a day, 5 days a week for 5 years—and maintenance costs have been practically negligible.

It used to be a back-breaking task to manually load 55 lb. cartons of sugar on a skid as they come off a conveyor. Now, by placing the skid on a lift and lowering the lift as the pile of cartons builds up, manual lifting is eliminated. When the skid is fully loaded, the lift is raised and the skid taken off by an automatic lift truck. Men can now work at this job on 4 hour shifts *without fatigue*, and the job is no longer the "toughest duty in the plant."

If your factory has a problem in material handling—feeding machines, loading or unloading trucks, moving material to different levels, you too can perform this work better, faster, and at lower cost with Curtis Hydraulic Lifting Cylinders.

Curtis Hydraulic Lifting Cylinders Offer You:

- Low first cost
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- Capacity up to 17 tons
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- Safety oil locked at all heights

Manufacturers throughout the country are cutting costs and improving production with Curtis Hydraulic Lifting Cylinders. It will pay you to investigate the wide range of uses for this equipment. Send the coupon below for detailed bulletin and free booklet on "How Air Is Being Used in Your Industry."

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requirements, it is available from stock in 24 sizes for shafts of ½ in. to 3 in. diameter. Sloping surfaces between cap and base maintain concentricity and relieve the cap bolts of direct stress from side thrusts. Removable shims between base and cap provide for needed adjustment. Cap bolts do not protrude above the top of the bearing. The bore is broached to size with the cap in place. The ends of the bearing are finished to provide accurate bearing surfaces for collars, pulleys gears, sprockets and other limiting devices. The bearing cap is tapped for a grease cup or hydraulic fitting, and there is a groove in the cap bore for the distribution of lubricant. The base is ground to close tolerances and is recessed to compensate for inaccuracies in the surface of the structural support.

The development and manufacture of a new line of rubber-tread idlers for supporting the return run of 14 to 60-in. wide belt conveyors also has been announced by the Link-Belt Co. Each complete idler consists of from four to twelve 6-in. diameter rubber-tired rolls suitably spaced and mounted on a Friction Fighter roller-bearing-equipped steel tube that will fit into the same supporting hangers as the regular Link-Belt return idler roll. The individual rolls consist of a renewable extruded rubber tire clamped between two steel discs firmly held together by three roundhead bolts. As the rubber tire is made split, it can readily be replaced with a new tire when required by just removing three nuts. The new idlers are especially recommended for conveyors handling corrosive, abrasive, wet, or sticky materials, such as salt, coke, phosphate rock, fertilizers and wet coal.

THREE new infra-red heat lamps will be placed on the market May 15 by the Birdseye Division of Wabash Appliance Corp., Brooklyn. Two of the lamps will be clear, for use with the standard gold-plated or Alzac reflectors, but the third will not require any separate reflector since it will be built with its own reflector lining sealed inside to keep it free from oxidation and the collection of dust, dirt and fumes. The manufacturer states that the reflector lining will maintain its heat-reflecting value for the 6000-hr. life of the bulb because it will be made of pure solid silver and will be sealed inside the gas-filled bulb.

CERTAINLY our plant is running at capacity. Certainly we have a backlog of orders. Who hasn't? But you won't find an independent *"sitting-on-our-backlog, got-all-we-can-handle, take-it-or-leave-it"* attitude at Accurate.

You'll find that we're just as anxious to get your business—*and hold it*—as we ever were. We want your inquiries and orders, and if you're in a tight spot, we'll do our best to help you out of it.

Right now we're juggling men and time and materials to give delivery where it's needed as quickly as possible.

Sure, it costs us more to do it that way, but looking ahead a few years, we think that this effort will pay us well in your continued patronage.

Definitely, it may pay you today—let's talk it over. Drop us a note or phone now.

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Full of valuable data. Write for your free copy today!

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STAMPINGS

Accurate Springs

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International Machine Tool Reorganized by New Heads

C. Russell Feldmann of New York and E. H. Welker of Detroit recently purchased controlling interests of the Foster Machine Co., Elkhart, Ind. Just prior to the deal, the Foster company had purchased outright the entire assets of International Machine Tool Co., Indianapolis.

Name of the parent company has now been changed to International Machine Tool Corp. operating as the Foster Division in Elkhart and as the Libby Division in Indianapolis. Mr. Feldmann is president and treasurer of the corporation and Mr. Welker is executive vice-president.

Howard Ashley Pedrick

Howard Ashley Pedrick, age 78, who died March 5 at State College, Pa., was the inventor of the "heat-shaping" process whereby piston rings, after being machined and gapped, are expanded on a taper mandrel and then heat treated to give them the necessary tension. He also had nearly 50 other patents to his credit, including one relating to the pneumatic control of vehicles equipped with air brakes, which system is said to be widely used on modern trolley cars, buses and railroad trains.

James W. Wilford

James W. Wilford, a director of Reo Motors, Inc., died April 6 at his home in Lansing. He was 63 years old and had been associated with the automotive industry for more than 35 years.